# metals review

the news digest magazine

Volume XXIX-No. 7 July, 1956


## WHAT IS YOUR TIME WORTH?

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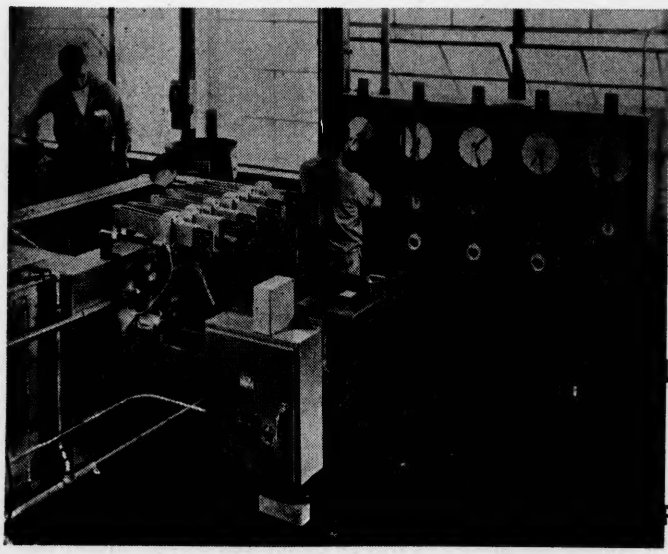

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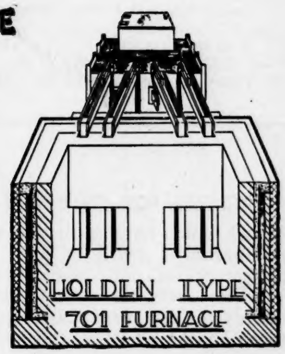


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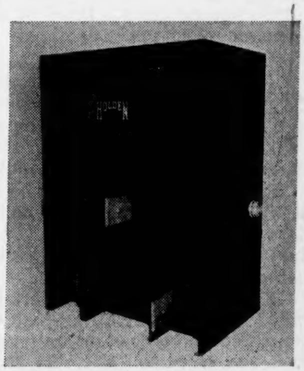

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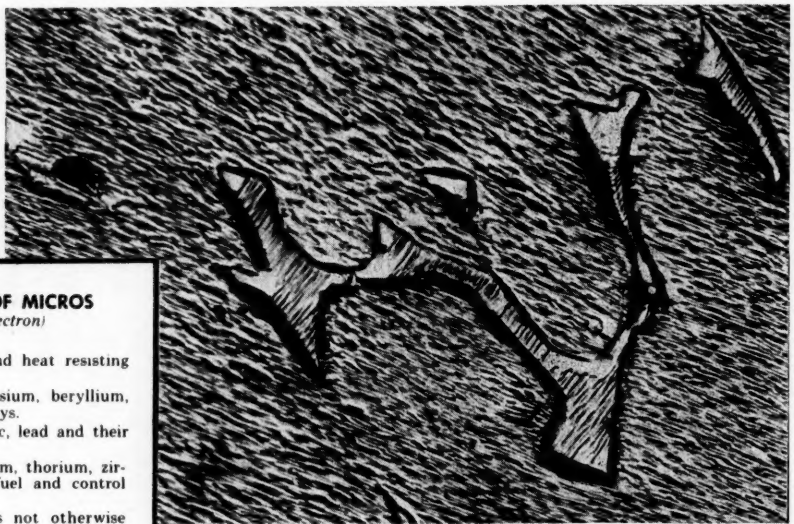
THREE F.O.B. POINTS—LOS ANGELES, DETROIT and NEW HAVEN

# 11th Metallographic Exhibit



**CLASSIFICATION OF MICROS**
*(Optical and Electron)*

Class 1. Irons and steels.
Class 2. Stainless steels and heat resisting alloys.
Class 3. Aluminum, magnesium, beryllium, titanium and their alloys.
Class 4. Copper, nickel, zinc, lead and their alloys.
Class 5. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements.
Class 6. Metals and alloys not otherwise classified.
Class 7. Series showing transitions or changes during processing.
Class 8. Welds and other joining methods.
Class 9. Surface coatings and surface phenomena.
Class 10. Results by unconventional techniques (other than electron micrographs)
Class 11. Slags, inclusions, refractories, cermets and aggregates
Class 12. Color prints in any of the above classes (no transparencies accepted)

*Entries are invited in the 11th ASM Metallographic Exhibit, to be held at the National Metal Exposition in Cleveland, Oct. 6 through 12, 1956.*

### *RULES FOR ENTRANTS*

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable. Photographic prints should be mounted on stiff cardboard; maximum dimensions 14 by 18 in. (35 by 45 cm.) Heavy, solid frames are unacceptable. Entries should carry a label on the *face* of the mount giving:

Classification of entry
Material, etchant, magnification
Any special information as desired

The name, company affiliation and postal address of the exhibitor should be placed on the *back* of the mount.

Entrants living outside the U. S. A. should send their micrographs by first-class letter mail endorsed "Photo for Exhibition—May be opened for customs inspection".

Exhibits must be delivered before Oct. 1, 1956, either by prepaid express, registered parcel post or first-class letter mail, addressed to:

**ASM Metallographic Exhibit**
**7301 Euclid Ave.**
**Cleveland 3, Ohio**

### AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $100, will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters in Cleveland.

All photographs may be retained by the Society for one year and placed in a traveling exhibit to the various Chapters. They will be returned to the owners in May 1957 if so desired.

## 38TH NATIONAL METAL CONGRESS AND EXPOSITION

**CLEVELAND, OHIO** **OCTOBER 6 to 12, 1956**

# Metals Review

VOLUME XXIX, 7 July, 1956

THE NEWS DIGEST MAGAZINE



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***Papers for Presentation at the National Metal Congress Cleveland, Oct. 8-12, 1956***

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1. **Slip, Twinning and Fracture in Single Crystals of Iron,** by J. J. Cox, E. I. DuPont deNemours & Co., G. T. Horne and R. F. Mehl, Carnegie Institute of Technology.

2. **Dynamic Biaxial Stress-Strain Characteristics of Aluminum and Mild Steel,** by George Gerard and Ralph Papirno, New York University.

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4. **Effect of Strain Rate and Temperature on the Plastic Deformation of High-Purity Aluminum,** by T. A. Trozera, O. D. Sherby and J. E. Dorn, University of California.

5. **Effect of Subboundaries and Carbide Distribution on the Notch Toughness of an Ingot Iron,** by J. C. Danko and R. D. Stout, Lehigh University.

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11. **A Study of the Air Contamination of Three Titanium Alloys,** by J. E. Reynolds, H. R. Ogden and R. I. Jaffee, Battelle Memorial Institute.

12. **Effect of Sulphur on the Properties of Titanium and Titanium Alloys,** by L. W. Berger, D. N. Williams and R. I. Jaffee, Battelle Memorial Institute.

13. **Relationship Between Heat Treatment, Structure and Mechanical Properties of a Titanium Alloy Containing 4% Cr and 2% Mo,** by A. W. Goldenstein and W. Rostoker, Armour Research Foundation.

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17. **On the Cooling Transformations in Some 0.40% Carbon Constructional Alloy Steels,** by D. J. Blickwede and R. C. Hess, Bethlehem Steel Co.

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19. **Transformation Kinetics of Uranium-Niobium and Ternary Uranium-Molybdenum-Base Alloys,** by R. J. Van Thyne and D. J. McPherson, Armour Research Foundation.

20. **Transformation Kinetics of Uranium-Molybdenum Alloys,** by R. J. Van Thyne and D. J. McPherson, Armour Research Foundation.

21. **Plastic Deformation of Uranium on Thermal Cycling,** by H. H. Chiswik, Argonne National Laboratory.

22. **Impact Characteristics and Mechanical Properties of Leaded and Nonleaded C-1050 and C-1141 Steels,** by A. P. Weaver, Inland Steel Co.

23. **Relation of Inclusions to the Fatigue Properties of SAE 4340 Steel,** by H. N. Cummings, F. B. Stulen and W. C. Schulte, Curtiss-Wright Corp.

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27. **Martensitic Transformation in the Machining of Austenitic Stainless Steel,** by E. F. Erbin, Titanium Metals Corp. of America, E. R. Marshall, University of Vermont, and W. A. Backofen, Massachusetts Institute of Technology.

# Los Angeles Holds Student Meeting

*The Los Angeles Chapter Was Recently Host to Some 100 High-School Students and Teachers at a Special Dinner Meeting. Included at the speakers' table were, from left: Arthur Andresen, administrator of secondary assignments, Los Angeles Board of Education; Howard Farmer, master of ceremonies; and Roy E. Paine, chairman of the Los Angeles Chapter*

More than 100 high-school science students and teachers were guests at a special dinner meeting of the **Los Angeles Chapter.**

Representing 35 schools from the Los Angeles District, the students and educators were told of the role of metals in man's history, modern day profession of metallurgy, educational requirements in the field and the problems and opportunities existing in metallurgical science and engineering in a series of addresses by A.S.M. representatives.

Organized and directed by the educational committee of the Chapter, the program included discussions by George Gallagher, consultant, Donald D'Amico, Joseph T. Ryerson & Son, Inc., James Cady, University of Southern California, and F. Robert Kostoch, North American Aviation. Howard Farmer, International Nickel Co., served as master of ceremonies.

Chairman of the educational committee, W. V. Ward, said meetings of this kind would become annual events for the Los Angeles Chapter as an aid and a stimulant to direct high-school students into the metallurgical science field.

Guests from the Los Angeles City Board of Education included Keith Smith, supervisor of science and mathematics, Arthur Andresen, administrator of secondary assignments, and Charles Migliazzo, supervisor of science for the Division of Secondary Education.—**Reported by W. V. Ward for Los Angeles.**

## Annual Meeting and Ladies Night Combined in Montreal

The Annual Meeting of the **Montreal Chapter** was held recently in combination with Ladies' Night. J. J. Waller, the outgoing chairman, and Mrs. Waller presided at the dinner. The meeting was attended by 232 members and guests.

Twenty-five year certificates were presented to: Air-Reduction Canada Ltd., represented by O. Kobel; Clyde Brennan, C. M. Carmichael; Armand Dussault, Shawinigan Chemicals Ltd., represented by J. P. Ogilvie, Carl Whittemore, and A. R. Woods.

Miss Florence Gibson, of Robert Simpson Montreal Ltd. gave a talk and demonstration on "Cosmetics and Make-Up."

The retiring chairman read his report for the year and then called upon the incoming chairman, A. H. Boehm, to assume his office. A past-chairman's certificate was presented to Mr. Waller.—**Reported by Rafe Sherwin for Montreal Chapter.**

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28. **Transformation Products in Cold-Worked Austenitic Manganese Steel,** by R. K. Buhr, and S. L. Gertsman, Department of Mines and Technical Surveys, Ottawa, and James Reekie, Northern Electric Co., Ltd. (formerly Department of Mines).

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30. **Phase Relationships and Mechanical Properties of Some Iron-Chromium-Carbon-Nitrogen Alloys,** G. F. Tisinai and C. H. Samans, Standard Oil Co., Whiting, Ind.

31. **Effect of Sigma Phase on Co-Cr-Mo Base Alloys,** by Ronald Silverman, Sylvania Electric Co., William Arbiter, Nuclear Development Corp. of America, and Frank Hodi, U. S. Army.

32. **An Austenitic Alloy for High-Temperature Use,** by R. W. Guard and T. A. Prater, General Electric Co.

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34. **Effect of Environment on Creep-Rupture Properties of Some Commercial Alloys,** by Paul Shahinian, Naval Research Laboratory.

35. **Influence of Molybdenum on the Phase Relationships of a High-Temperature Alloy,** by H. J. Beattie, Jr., and F. L. VerSnyder, General Electric Co.

36. **Mechanical Properties of Iron-Aluminum Alloys,** by W. Justusson, V. F. Zackay and E. R. Morgan, Ford Motor Co.

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42. **A Constitution Diagram for the Alloy System Titanium-Tin,** by P. Pietrokowsky and Ellis P. Frink, California Institute of Technology.

43. **Tempering of Iron-Carbon Martensite Crystals,** by F. E. Werner, Westingouse Research Laboratories, and B. L. Averbach and Morris Cohen, Massachusetts Institute of Technology.

44. **Phase Relationship of the Calcium-Lithium Systems,** by M. R. Wolfson, U. S. Naval Ordnance Test Station.

# Discusses Fabrication of Clad Steel

*Shown at the Speaker's Table at the Joint A.S.M.-A.W.S. Meeting in the Northeast Pennsylvania Area Are, From Left: P. Stenn, Retired Chicago Bears Football Player, Coffee Speaker; G. E. Reed, Chairman of the Susquehanna Valley Section A.W.S.; L. K. Keay, Lukens Steel Co., Who Gave a Talk on the "Fabrication of Clad Steels"; and Chairman J. J. Penkoske*

Speaker: Louis K. Keay
***Lukens Steel Co.***

Louis K. Keay, technical service engineer, Lukens Steel Co., recently addressed a joint meeting of the **Northeast Pennsylvania Chapter** and Susquehanna Valley Section A.W.S., on "Fabrication of Clad Steel".

With the use of lantern slides, the speaker described the sandwich method of solid phase welding of the cladding material to base steel under heat and pressure. In this method suitably prepared steel and cladding metal or alloy plates are placed together with another similar pair of plates in a manner much like a sandwich with two slices of meat is prepared.

The surface between the two insert plates is coated with a refractory wash to prevent their welding together, and the edges of the sandwich are welded by the twin submerged-arc process. The assembly is heated to a temperature appropriate to both the base steel and the insert material and rolled to the desired thickness. The dimensions of the original assembly components required to produce a final clad product are predetermined on the basis of experience.

After final rolling, the roll pack edges are sheared off and the two clad plates separate. Final processing calls for annealing, chemical cleaning, and sometimes polishing.

All cladding metals and alloys, except nickel, are nickel plated at the beginning of the cladding operation to insure a good bond between the insert and the steel.

Mr. Keay pointed out that, in stainless cladding, the nickel also prevents the oxidation of the chromium in the stainless during heating and tends to minimize the migration of carbon across the bond interface which would form chromium carbides.

The bond obtained may be tested in shear, tension, bending or in special ways. Shear values are generally equal to the weaker component. The cladding was found to be uniform in thickness and did not lose adhesion when subjected to cyclic heating and cooling. Welding of the material requires compliance with certain recommended practices.

Besides nickel-clad steel, Lukens produces stainless steels, Inconel, Monel, copper and other special alloys in clad form.—**Reported by A. J. Babecki for Northeast Pennsylvania.**

# Describes Use of Ceramics In Aircraft Gas Turbines

Speaker: W. D. Moran
***General Electric Co.***

**"Ceramics for Aircraft Gas Turbines" was the subject of a talk presented by W. D. Moran, Thomson Laboratory, General Electric Co., at the Past Chairmen's Night meeting of the New Haven Chapter.**

**Mr. Moran outlined some of the fundamental problems confronting the design and materials engineers in the use of ceramics for aircraft gas turbines. He discussed General Electric's J-47 engine and explained how it operates, including details of operating temperatures and stresses of various components, the effect of gas temperature on thrust and specific fuel consumption, and also presented a comparison of high-temperature materials in stress rupture.**

**In a discussion on ceramic coatings, Mr. Moran outlined their possible benefits and requirements for A.G.T. applications, including the basic nature of frits, glasses and oxides when compounded into coatings, the effect of ceramic coatings on engine-tested components, how coating properties can aid in reducing heat losses, and how reduction of critical material usage through the use of coatings could be brought about.**

**Mr. Moran then described some of General Electric's work on nickel-magnesia cermets and the glass-bonded magnesia coatings, giving physical properties and aims in application. He described and outlined the properties and temperature limitations of solid ceramic bodies and their possible application to A.G.T. components, and described results obtained by government agencies in testing cermet bodies.—Reported by Kenneth L. Tingley for New Haven.**

# Golden Gate Holds Educational Series

*The Golden Gate Chapter and the Division of Mineral Technology of Stanford University Recently Sponsored a Joint Educational Program Which Was Offered to Selected High-School Students and Science Teachers. The program consisted of a group of short demonstration lectures on "Metallurgy—the Science and Engineering of Metals". About 100 persons attended the lectures. Shown are, from left, the lecturers: A. K. Schellinger, who spoke on "What Is Metallurgy?"; O. C. Shepard, who gave a talk on "Making Metals"; and R. A. Huggins, whose subject was "Using Metals". At right is Robert L. Ray, chairman of the education committee*

## Relates How Chemistry and Metallurgy Aid in Crime Detection at Ottawa

Speakers: R. Potvin and L. Gravel
*Laval University*

"Metallurgy and Chemistry at Work in Scientific Investigation and Crime Detection" was the subject of a talk given jointly by Roger Potvin and Lucien Gravel, professors of the departments of metallurgy and chemistry, Laval University, at a recent meeting of the **Ottawa Valley Chapter.**

Dr. Potvin discussed a number of typical examples of the application of metallurgy to the determination of the causes of accidents. These examples ranged from a somewhat simple water heater explosion to the burning of a ferry boat which came very near to being a major disaster. In discussing this latter investigation, Dr. Potvin showed how a knowledge of the behavior of copper at elevated temperatures had been used to prove that the fire warning systems on this boat had been made inoperative prior to the outbreak of the fire.

Dr. Gravel described how, in his duties as consulting chemist in scientific and legal work, chemistry had been applied to the solving of simple riddles and complex problems, such as the sabotage of an airplane which resulted in the killing of 23 persons.

While many of the investigations described by the speakers were quite humorous, they illustrated the perseverance, attention to detail and meticulous care which must be applied in the gathering of scientific evidence for presentation in courts of law.—**Reported by P. J. Todkill for Ottawa Valley.**

## *Fluoroscopy Is Subject in San Diego*

*At a Meeting Held Recently by the San Diego Chapter, Justin G. Schneeman (Left), Director, Testing Laboratories, X-Ray Products Corp., Presented a Talk Entitled "Industrial X-Ray — Radiography and Fluoroscopy — of Metals". At right is Charles L. Hibert, program chairman*

Speaker: J. G. Schneeman
*X-Ray Products Corp.*

Justin G. Schneeman, director, testing laboratories, X-Ray Products Corp., gave a talk on "Industrial X-Ray — Radiography and Fluoroscopy — of Metals" in **San Diego.**

Fluoroscopy is a valuable tool for proving the reliability of military weapons. Fluoroscopy is based on the ability of X-ray to cause certain materials, called phosphors, to give off visible light. In fluoroscopy, the X-ray beam, after penetrating the object under examination, strikes a fluorescent screen, causing it to glow and render a visible X-ray image almost immediately.

The chief difference between fluoroscopy and film radiography is that in radiography the radiation reacts on a film over a period of time to produce a latent X-ray image, which is later made visible by a film developing process.

The weapon - producing industries are using the fluoroscope for examination of small assemblies such as switches, radio tubes and shell fuses, which can be fluoroscoped for correct assembly. Electric wire and cable can be examined for breaks that are hidden by the insulation. Molded plastic parts as well as plastic sheet, tube and rod, can be checked for foreign inclusions or cavities. Fire brick can be examined for porous interiors and metal inclusions, or hidden knots can be revealed in wood products.

It is used extensively by defense industries for looking into light metal castings with cross section thicknesses of up to 1⅛ in. One of the newly developed advantages of the fluoroscope is for inspecting stainless steel honeycomb sandwiches, where other methods of quality control are not as accurate.

## *Speaks on Heat Treatment of Steels*


*Lawrence J. Hull, Secretary; A. O. Schaefer, National President; R. F. Mehl, Head, Department of Metallurgical Engineering, Carnegie Institute of Technology; National Secretary W. H. Eisenman; and T. E. Piper, Chapter Chairman, Are Shown at a Meeting Held Recently by the San Diego Chapter. Dr. Mehl presented a talk entitled "Heat Treatment of Steels"*

## 35 Years of Experience With Metals Outlined in Canada

Speaker: R. C. Stewart
*Vanadium Alloys Canada Ltd.*

The final meeting of the **Western Ontario Chapter** for the 1955-56 season consisted of a talk entitled "Retrospect—35 Years in Metallurgy" by R. C. Stewart, chief metallurgist, Vanadium Alloys Canada Ltd., and election of new officers.

Mr. Stewart gave an interesting account of his 35 years in the metallurgical field and some of the experiences gained as a 25-year member of A.S.M. He is a past chairman of the Ontario Chapter.—**Reported by R. V. Hutchinson for Western Ontario.**

# National Officers Sit-In on Radio Panel


*Shown During the Radio Broadcast at Los Alamos Are Members of a Panel Which Discussed the "Shortage of Scientific Personnel". From left are: William H. Eisenman, secretary A.S.M.; Robert Y. Porten, moderator, Station KRSN; A. O. Schaefer, president A.S.M.; John V. Young, personnel director, Los Alamos Scientific Laboratory; Jack Lyon, science teacher, Los Alamos schools; and R. T. Phelps, chairman of the Los Alamos Chapter*

The **Los Alamos** and **Albuquerque Chapters** held a joint meeting and ladies night at the La Fonda Hotel in Santa Fe in honor of National President A. O. Schaefer and Secretary William H. Eisenman.

Highlights of the evening were talks given by Mr. Schaefer and Mr. Eisenman. Bill, who was introduced by E. R. Jette, metallurgy head, Los Alamos Scientific Laboratory, described the program and progress of "The A.S.M. of Tomorrow".

Mr. Schaefer gave an interesting account of the experiences which he and Bill had been having in their visits to local chapters throughout the United States and Canada. He included an informative insight into national A.S.M. affairs.

Prior to the meeting, Mr. Schafer and Mr. Eisenman participated in a radio broadcast as honored guests in a panel discussion on the significant current subject, "The Shortage of Scientific Personnel". Other members of the panel, which was moderated by Robert Y. Porton of Los Alamos Radio Station KRSN, were John Young, personnel director, Los Alamos Scientific Laboratory, Jack Lyon, science teacher, Los Alamos school system, and Robert T. Phelps, chairman of Los Alamos Chapter.

Mr. Schaefer stated that the basic reason for the shortage of scientifically trained people is that we are living in an expanding economy containing an element, scientific work, the demand for which is also expanding, due to the tremendous growth of such fields as aircraft and guided missiles, communications and electronics, and atomic energy. He emphasized that only with trained personnel can industrial design be developed and refined.

Mr. Eisenman pointed up the extent of the shortage by adding that in years past the United States had produced and employed 50,000 engineers and scientists annually but that today we produce only between 17,000 and 24,000.

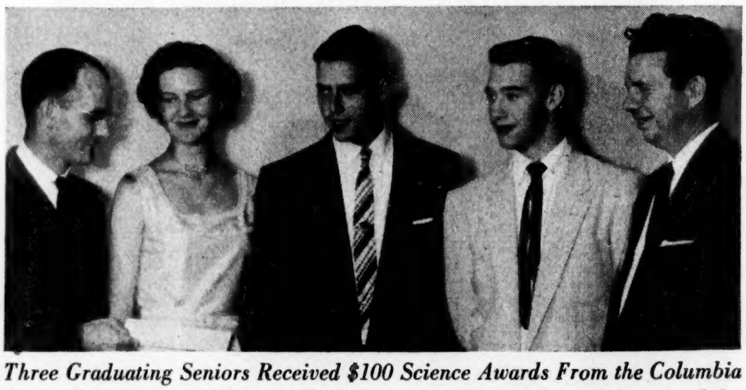
Mr. Young remarked that the situation is so critical as far as recruitment of personnel is concerned, that at one college, 300 engineers had accumulated 9000 interviews with industrial firms. On the humorous side, though with considerable significance, is the experience of one company which sent out 21 recruiters on a tour of colleges and had only 15 return. Evidently the recruiters are themselves being recruited in the highly competitive bid for technical personnel.

From the educators' standpoint, Mr. Lyon stated that the basic requisites for schools in enlisting potential scientists are to encourage them and stimulate them.

In response to inquiry as to what the A.S.M. is doing to lessen the serious shortage of scientifically trained people, Mr. Schaefer and Mr. Eisenman outlined the five-point program for "The A.S.M. of Tomorrow", describing particularly the Metals Engineering Institute for on-the-job training and in-the-home study to develop skilled technicians in industry, the program for metallurgical seminars for refresher courses and up-to-date information on the metals industry, the plan for a metals research laboratory and a metal science university.

The entire discussion was very timely and informative, and judging from comments throughout the community, very stimulating. The dinner which followed featured the flavor of the southwest in the unique atmosphere of the La Fonda of Santa Fe. It was well attended by members and wives from both the Albuquerque and Los Alamos Chapters.—**Reported by Daniel J. Murphy for Los Alamos.**

# Receive Awards at Columbia Basin



*Three Graduating Seniors Received $100 Science Awards From the Columbia Basin Chapter at a Meeting Held Recently. Shown, from left, are: John H. Rector, chairman; Polly Anne Hills, Columbia High School; William S. Wolfe, Kiona-Benton High School; Nicholas A. Speed, III, Columbia High School; and L. D. Turner, chairman of the educational committee of the Chapter. The awards were presented for outstanding citizenship and scholastic achievements and desire to enter the field of metallurgy or science. All three recipients plan to enter the University of Washington*

## Compliments

To JAMES J. CURRAN, on his appointment to assistant professor in the metallurgical engineering department of the University of Pittsburgh. Mr. Curran was associated for 13 years with the Henry Souther Engineering Co. in general metallurgical consultation and for 20 years with the Walworth Co. as chief metallurgist. He is a 25-year member of A.S.M. and a member of the Pittsburgh Chapter.

♦ ♦ ♦

To the PUGET SOUND CHAPTER, which has set up a $200 scholarship to the University of Washington.

♦ ♦ ♦

To ALUMINUM CO. OF AMERICA and AMERICAN STEEL FOUNDRIES on being chosen by the 1956 Manual of Excellent Managements, published by the American Institute of Management, from among the 409 companies it lists as deserving particular merit for excellence in one or more of the Institute's areas of management appraisal.

♦ ♦ ♦

To ORSON H. DAVENPORT, on being awarded Utah Chapter's first prize award in its Scholarship Essay Contest.

## Outlines Problems of Atomic Energy

*J. E. Burke (Right), Manager, Ceramic Studies, General Electric Co., Presented a Discussion of the "Metallurgical Problems in the Use of Atomic Energy" at a Meeting in Montreal. He is shown with J. J. Waller, chairman*

### Speaker: J. E. Burke
*General Electric Co.*

J. E. Burke, manager, ceramic studies, General Electric Co., discussed some "Metallurgical Problems in the Use of Atomic Energy" at a meeting held by **Montreal.**

Dr. Burke outlined the basic physics of nuclear energy and described the fission process, chain reactions, types of thermal and power reactors, breeders and converters. In this field, the metallurgist faces the usual problems and some new ones, particularly where he has to work with the physicist's restrictions. Unusual features to be contended with include the corrosion and erosion of the core cladding, thermal stress and fatigue in the various elements of the core and cladding, and diffusion and radiation effects which may change pure metals into alloys. The fuel elements must withstand high temperature without deteriorating too rapidly, and methods have to be devised for dumping the used fuel safely.

Materials employed for reactor components are selected partly on their capture cross section, or capacity to absorb neutrons per unit area. Low cross sections are chosen where the neutrons must pass freely through the material, and high cross sections are used where the neutrons must be absorbed by the material. Zirconium and beryllium are two of the more unusual metals selected, and liquid sodium is sometimes the choice for the coolant.

Fuel elements of uranium have an unfortunate characteristic of growth or dimensional instability when cycled at reactor temperatures. Uranium can increase as much as six times its original length, due to disoriented slip planes. The unfortunate part is that this growth can also be caused by radiation, a mechanism not yet fully understood.

Dr. Burke pointed out that the nuclear reactor afforded an opportunity for study and development of a whole range of comparatively unused metals. There is a tendency to think in terms of a handful of common metals such as aluminum, iron and copper, and departure into "new" metals for the "atomic age" presents a challenging field for the metallurgist.—**Reported by Rafe Sherwin for Montreal Chapter.**

## Annual Award Medal Is Inaugurated by New York

One of the outstanding events in the 1955-56 season of the **New York Chapter** was the inauguration of a Chapter Award Night. The New York Chapter Medal will be awarded annually to a metallurgical engineer or metallurgist in the New York area in recognition of work of unusual merit in research, engineering and management. It is the feeling of the officers, the executive committee and the chapter awards committee that this honor should go to up-and-coming men in the profession who have much of their career before them, rather than well-recognized recipients of numerous other awards. It is aimed at the as-yet-unsung individual who may have carried out much hitherto unpublicized work of unusual merit.

Howard Shaeffer Avery, research metallurgist at the metallurgical laboratory, American Brake Shoe Co., was the first recipient of the New York Chapter Medal, in recognition of his contribution to the technology of heat and wear resistant alloys.

Mr. Avery joined American Brake Shoe in 1934 after having obtained his B.S. and engineer of mines degree from Virginia Polytechnic Institute in 1927 and 1928, respectively, and amassing experience in mining and geology in Mexico, in steel mills and in teaching. His major activities have been in the field of heat and wear resistant alloys and he has contributed extensively to this field in the various metallurgical journals. Among these papers were one on "Austenitic Manganese Steel" and one on "Hard Surfacing by Fusion Welding". Mr. Avery is also active in the professional societies, serving on various specification, program and educational committees. He is chairman of the American Welding Society's filler metal subcommittee on hard facing alloys.

The presentation of this award was one of the high points in an eventful season which saw fission of the New York nucleus into two chapters, replacement of the traditional stag dinner with a Valentine's Day dinner-dance, and movement to a new and luxurious meeting place. The new look, developed under the leadership of chairman John P. Nielsen, with the assistance of his officers and executive committee, will be brightened even further by incoming chairman Kempton H. Roll.—**Reported by Leslie Seigle for New York Chapter.**

# Material Problems Of Nuclear Reactors Philadelphia Topic

Speaker: W. D. Manly

*Oak Ridge National Laboratory*

The **Philadelphia Chapter** heard a talk by W. D. Manly of the Metallurgy Division, Oak Ridge National Laboratory, on "Material Problems With Nuclear Reactors".

Mr. Manly outlined the early trials and tribulations and the difficulties encountered because of the veil of secrecy on all the early operations. The first reactor went critical in December 1942 in the football stands of the University of Chicago. In an unclassified release in March 1952 it was reported that 25 various reactors were in operation and 10 more were contemplated, and, at that time, it was shown that in addition to the United States, such foreign countries as France, India, Brazil, Canada, Argentina, Sweden, Norway, Belgium, and Holland had an active reactor program. So, in just 10 years, reactor technology has become a large industry from its humble start at the University of Chicago.

Several types of reactors are now in the process of being built under the five-year reactor plan. These types are: homogeneous; boiling reactor (a solid fuel element and a water moderator which boils steam and transmits power direct to a turbine); sodium graphite reactor (solid uranium with a graphite moderator in which the coolant is liquid sodium); fast reactor (a solid fuel element with liquid sodium, plus fast neutrons for breeding); and a pressurized water reactor (a solid fuel element which is cooled and moderated by pressurized water).

With the aid of a series of slides, Mr. Manly explained the parts of a nuclear reactor. Analogies were made to a standard automobile engine, thereby explaining the function of the fuel, coolant, shield, structure, moderator and control.

Common fuels mentioned were U-235, U-239 and U-233. Such terms as isotope, neutrons, gamma rays, flux, cross section (measure by barns $10^{-24}$ sq.cm.), were defined.

The coolants presently utilized in reactors are bismuth, lead, sodium and potassium, in addition to air and water, and, for control, the elements used are hafnium, boron, cadmium and the rare earths. For moderators, which are used to slow down the neutrons, beryllium oxide, graphite and beryllium are utilized. Shields which protect against gamma rays are usually made of lead, water or concrete. The structure of the reactor is usually made of magnesium, zirconium, or aluminum.

A rather thorough explanation was given as to how all the necessary parts are put together to build a reactor. As an example, Mr. Manly used the graphite reactor at the Oak Ridge National Laboratory which has been in operation since the end of 1943. Through the use of slides and appropriate commentary, Mr. Manly described the component parts and their function in the reactor.

To describe the problems confronting a metallurgist in working in the nuclear field, Mr. Manly gave a hypothetical problem on the design of a high-temperature reactor for use as the power supply in automobiles.

The next phase of reactor design discussed was the problem of corrosion—probably the biggest problem in reactor business. One of the present projects pending is the design of simple tests to indicate the performance of metals at high temperature and high flow velocities in the presence of various heat transfer liquids.

Each component of a reactor presents a specific problem to the metallurgist and many of the solutions have not been satisfactorily carried to completion. The shortage of personnel trained in the reactor technology is still acute, but it is visualized that with American ingenuity and the solution of material problems, the result will be electricity generated in the U.S.A. and remote locations by atomic fission.—**Reported by Willard Hunsberger and Louis F. Calzi for Philadelphia.**

# Low-Carbon Martensite Discussed at Peoria

Speaker: Robert H. Aborn

*U. S. Steel Corp.*

At a meeting of **Peoria Chapter**, Robert H. Aborn, director of Edgar C. Bain Laboratory for Fundamental Research, U. S. Steel Corp., discussed "Low-Carbon Martensites".

Engineers have regarded martensite with mixed emotions. They desire the toughness and strength that can be obtained by proper heat treatment, but worry about its susceptibility to cracking. Recently, low-carbon martensites, below 0.20% carbon, have been used, and they exhibit a high degree of strength and toughness, weldability and formability.

Investigations have been conducted comparing A.I.S.I. 1013 and 4315 steels, and the low-carbon martensitic structures showed a high degree of notch toughness and ductility.

Electron metallographic techniques were used to investigate the structures obtained by quenching these low-carbon materials. A form of tempering, called Q-tempering, occurs during the quenching operation in which low-carbon martensite is formed. The amount of Q-tempering depends on the temperature at which martensite forms and the cooling rate; the 1013 material exhibited a higher degree of Q-tempering than the 4315 or higher alloy material. The high notch toughness of low-carbon martensite is believed to be a result of Q-tempering of the martensite matrix. Because of the effect of Q-tempering, the structure of low-carbon martensite does not materially change up to a tempering temperature of about 400° F. Type 403 (12% Cr) and 301 (17% Cr, 7% Ni) stainless steels are widely used low-carbon martensitic materials, also other special low-carbon steels containing less than 3% total alloy content have been approved for welded pressure vessel application in quenched and tempered condition.

The talk was concluded with a special high-speed movie of the onset and progress of plastic deformation and associated transformation of Type 301 steel. The formation and progression of slip bands and the transformation of austenite to martensite were observed on the polished and etched surface during stretching. **—Reported by James M. Warfield for Peoria Chapter.**

# *Metallizing Is Theme at Worcester*


*Shown at a Recent Meeting Held by Worcester Chapter Are, From Left: Walter F. Apfel, Braeburn Alloy Steel Corp., Technical Chairman; Charles J. O'Boyle, Eastern District Manager, Metallizing Engineering Co., Inc., Who Spoke on "Processes and Applications of Metallizing"; C. Golden, New England Sales Engineer, Metallizing Engineering Co., Inc.; and H. D. Berry, Vice-President, Thomas Smith Co., Chairman. (Reported by C. W. Russell)*

# Metallurgical News and Developments

***Devoted to News in the Metals Field of Special Interest to Students and Others***

A Department of *Metals Review,* published by the
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

**Welding Conference** — Conditions under which it is economical to utilize welding in manufacturing processes, and which welding method is preferred for the particular job, will be stressed at the third annual Midwest Welding Conference to be held in Chicago from Jan. 30 to 31, 1957, by Armour Research Foundation and the Chicago Section of the American Welding Society.

**Change in Name**—F. J. Stokes Machine Co., Philadelphia, has changed its name to F. J. Stokes Corp., effective July 1. The new designation was selected as being more in keeping with the broad range of the company's interests and the varied line of production and processing equipment which it has developed during its 60 years of growth.

**Open Lab**—Continental Can Co. has opened a new $7-million laboratory in Chicago for research and engineering; 265 scientists and technicians will man the lab.

**Uranium Expansion**—A multi-million dollar expansion program near Rifle, Colo., to include a new uranium processing mill, will greatly increase uranium production by Union Carbide Nuclear Co., a division of Union Carbide & Carbon Corp.

**Offer Booklet** — Tempil Corp., 132 West 22nd St., New York 11, N. Y., has announced that it has a supply of the manual "Recommended Practice for the Welding of Steel Castings" which will be sent out on request as long as the supply lasts.

**Reach Agreement**—Midvale-Heppenstall Co. and Allegheny Ludlum Steel Corp. have completed an agreement for the sale by Allegheny of technical knowledge and patent rights for the production of consumable electrode vacuum remelting of steel and ferrous group base alloys. Midvale-Heppenstall plans to proceed to install production facilities to utilize the process.

**Scholarships**—Cerro de Pasco Corp., major mining company with extensive properties in Peru, has named four Peruvians to post-graduate, one-year scholarships in the U.S. in a program designed to encourage advanced scientific and technical studies by its technicians. The winners will attend the Colorado and Montana School of Mines.

**Foundry Research** — The incorporation of the Steel Foundry Research Foundation was announced at the 54th Annual meeting of the Steel Founders' Society in Chicago. This Foundation is an Ohio corporation established as a nonprofit organization for scientific and educational purposes, to include research in the social and natural sciences as related to technology, production and distribution of castings made of steel or metal alloys.

**Set Record**—Recent modifications of General Electric's methods of making "perfect" iron crystals have produced tiny whiskers with tensile strengths as high as 1,900,000 psi., a strength more than 150 times that of ordinary iron crystals and four times that of the strongest steel wire.

**Cut Titanium Cost**—Titanium Metals Corp. of America has announced a reduction of 20c lb. in the price of titanium sponge metal, bringing the price down to $3.25. This is the fourth cut in a 14-month period and is part of an aggressive program to make this metal fully competitive with certain steels, aluminum and magnesium.

**Investment Casting Course**—Investment Casting Institute will sponsor a six-day intensive course in investment casting at the University of Michigan, Sept. 10 to 15, 1956.

**Metal Walls**—Building Research Institute has announced plans to hold a two-day meeting for the purpose of developing technical information for general use in the building industry for the design, manufacture and erection of metal curtain walls.

**Oxygen Converters** — Pennsylvania Engineering Corp. has been awarded a contract by Kaiser Engineers to fabricate two top blown oxygen steel converters of 65-ton capacity for installation at the Aliquippa Works of Jones & Laughlin Steel Corp.

**Tubed Sheet**—A tubed sheet product with one side flat and the entire tubing pattern expanded on the other side has been developed by Reynolds Metals Co. This development has interest and advantages for manufacturers of refrigerators and home freezers and may have important contributions in supersonic aircraft. This tube eliminates the necessity of bending a complicated pattern in tubing and then brazing or welding the tubing to a sheet, the previous method used in making certain heat exchangers.

## *Past Chairman Honored at Tulsa*

*George Clay (Left), Incoming Chairman of the Tulsa Chapter, Is Shown Presenting Paul Ogden With a Past Chairman's Certificate. Mr. Ogden was congratulated for his outstanding performance during his period of service, which included the institution of a class in elementary physical metallurgy at the University of Tulsa. Over 100 students from various local industries are currently attending the course. (Reported by Ferris A. Dewey)*

## *Hold First Meeting in Wilmington*

*Members of the Philadelphia Chapter in the Wilmington (Del.) Area, Held Their First Meeting Recently. They heard Robert F. Mehl (right), head, department of metallurgical engineering, Carnegie Institute of Technology, speak on "European Metallurgy". He is shown with J. D. McNutt, chairman*

Speaker: Robert F. Mehl

***Carnegie Institute of Technology***

After considerable thought, planning and effort on the part of a small group of local A.S.M. members, the first meeting of the **Wilmington Section** of the Philadelphia Chapter was held early in April. Some 84 members and guests were present to hear Robert F. Mehl, head, department of metallurgical engineering, Carnegie Institute of Technology, speak on "European Metallurgy". This interesting and informative talk on the facilities, methods, and objectives of metallurgical research, as practiced in Great Britain, France and Germany, represented a firsthand report, since Dr. Mehl had recently returned from an extended tour abroad.

Programs of this type are certain to attract the attention and interest of all local A.S.M. members and potential members. Formation of the Wilmington Section was prompted by the need for such activities "close to home", both geographically as well as in program material. This need has long been felt by many in the area, who are now encouraged that, with the interest shown in this initial activity, there are a sufficient number of engineers, metallurgists and other interested persons to have an active group of A.S.M. members in the Wilmington area.—**Reported by N. E. Whitcomb for Wilmington.**

**A.S.M. prepares and distributes, on request, preprints of the technical and scientific articles which are presented at the annual convention.**

## Impact of Automation on Large Presses Described

Speaker: L. Mollick

***Baldwin-Lima-Hamilton Corp.***

The **Kansas City Chapter** heard a talk on "Impact of Automation on the Large Press" by L. Mollick, chief stress analyst for the Loewy Hydropress Division, Baldwin-Lima-Hamilton Corp.

Mr. Mollick described the Air Force large press program and presented the background of how and why it is so vital as a first line defense measure. In order to define the design thinking that goes into the manufacture of such a precise and yet huge piece of equipment, he showed the various components by means of a series of slides.

The importance of photo-elastic analysis was emphasized as a key tool in building in the engineering requirements. This was such a successful tool that the same design used in the 50,000-ton press is applicable to a 100,000-ton press. Use of the same design techniques was also applied to the manufacture of an extrusion press.

With the design of presses of ever-increasing capacity, the problem of precise and reliable control assumes increased importance.

Not only must operations, which have heretofore been manual, be automated, but the press functions under the operators' control must be remotely controlled and power amplified. This involves the introduction of feed-back control techniques. Some hydraulic circuits illustrating these concepts were discussed. Among these were designs utilizing feed-back techniques for synchronizing cylinder speeds and for controlling press speeds under varying load conditions.

In applying forces in the thousands of tons, the safety problems are given increased emphasis. For example, the possibility of excessive eccentric loading was discussed, and designs for automatic compensation of eccentric loading were presented.—**Reported by D. C. Goldberg for Kansas City.**

## Speaks in Hartford on Production of Titanium

Speaker: R. S. Nycum

***Titanium Metals Corp. of America***

At a recent meeting of the **Hartford Chapter,** Robert S. Nycum, assistant manager of sales, Titanium Metals Corp. of America, spoke on the "Titanium Industry".

He briefly traced the history of methods for producing titanium from its ores, through the development of the Kroll process which is used by most producers today.

Mr. Nycum stated that the titanium industry really started in 1950 with production measured in pounds and has grown very fast so that in 1955 its output was measured in thousands of tons. During this period there has been a gradual reduction in price but most mill products still range from about $10 to $20 a lb. So far most of the titanium and titanium alloys produced have been used for military aircraft.

Other uses which were mentioned have been in civilian aircraft, ordnance, navy ships and the chemical industry. As the price continues to go down it is hoped these latter uses can be expanded.

Mr. Nycum showed an interesting series of slides which followed the production of titanium by the Kroll process at Titanium's Henderson, Nev., plant. Titanium production begins with Australian rutile at 10c a lb. and titanium sponge is produced worth $3.45 a lb. At present the processing is all done in batches with heavy expensive equipment to prevent contamination of the titanium. Essentially the process consists of mixing the rutile ($TiO_2$) with coke and reacting it with hot chlorine gas to form titanium tetrachloride. This material is then reacted with magnesium ingot metal to form titanium sponge and magnesium chloride. The magnesium and chlorine are recycled after being separated by the electrolysis of the magnesium chloride. The titanium sponge is crushed, mixed with alloys as required and formed into an electrode which is then double melted under vacuum in a water-cooled copper mold which forms a homogeneous ingot of titanium.—**Reported by B. L. Taft for Hartford Chapter.**

# IN RETROSPECT

A distinguished visitor to the Sixth Annual Convention and Exposition of the American Society for Steel Treating held in Boston in 1924 was KOTARO HONDA of the Tohoku Imperial University of Japan (now deceased). He presented three papers during the week of the convention on freezing points of metallic alloys, transformations in pure iron, and metallurgical education. Dr. Honda was made an honorary member of the Society at that time.

♦ ♦ ♦

A session on salt baths was featured during the technical program for this convention. Speakers were SAM TOUR of Doehler Die Casting Co. (now president of Sam Tour & Co., Inc.), Major A. E. BELLIS of Bellis Heat Treating Co. (deceased), and W. J. MERTEN of Westinghouse Electric and Mfg. Co. (deceased). Mr. TOUR'S paper was published in Vol. 6 of the *Transactions*, page 171.

♦ ♦ ♦

The Second Henry Marion Howe Medal was presented to FRANCIS F. LUCAS, then of Western Electric Co. (now deceased) for his paper on "High-Power Photomicrography of Metallurgical Specimens".

♦ ♦ ♦

Publication of Metals Handbook began in 1924 with the first of a series of looseleaf sheets. Data on 17 subjects covering 116 pages were distributed to the members.

♦ ♦ ♦

The report of the National Treasurer, ZAY JEFFRIES, for 1924 showed that the assets of the society had grown from $16,520 in 1921 to the impressive total of $66,362 in 1924. Secretary Eisenman's report points out that it was this healthy financial situation that made it possible to increase the services to members by issuance of the Handbook "data sheets".

♦ ♦ ♦

The death of EDWARD DEMILLE CAMPBELL, blind professor of chemical engineering at University of Michigan and honorary member of the Society, is announced in the October 1925 issue of *Transactions*.

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The trend toward broadening the society's interests beyond the confines of "steel treating" is noted in the December 1925 issue of *Transactions*, which reports a convention session on the relative merits of steelmaking by the acid and basic openhearth process and electric furnace process. The report indicates that this was "the first effort of the Society on this important subject".

♦ ♦ ♦

The session, presided over by JOHN A. MATTHEWS, vice-president of Crucible Steel Co. of America (an honorary member of A.S.M., now deceased), attracted an attendance of about 500 members.

# *Atomic Reactors Topic in Pennsylvania*

*Shown at the Speaker's Table at a Meeting of the Northeast Pennsylvania Chapter, Are, From Left: John J. Penkoske, Chairman; H. Etherington, Nuclear Energy Products Division, ACF Industries, Inc., Who Spoke on "Atomic Reactors"; and F. C. Brautigam, Vice-Chairman of the Chapter*

Speaker: Harold Etherington

***Nuclear Energy Products Division***
***ACF Industries, Inc.***

Harold Etherington, vice-president of the Nuclear Energy Products Division, ACF Industries, Inc., recently presented a talk before the **Northeast Pennsylvania Chapter** on "Atomic Reactors".

Mr. Etherington opened with a discussion of basic atomic structure, including the relation of structure to periodicity and the characteristics of element isotopes. An analogy was drawn between release of energy in chemical combination or dissociation of elements and release of energy in nuclear fusion and fission reactions. For fusion to occur, the atomic nuclei must combine at high velocities and high temperatures such as exist on the sun. The speaker stated that controlled fusion reactors are possible, but not probable, in the near future.

As an example of a fission reaction, the speaker cited the splitting of the $U^{235}$ nucleus by a neutron with its accompanying energy release and additional neutrons to carry on the reaction when conditions are favorable. In fission, the resulting particles separate with about 1/30 the velocity of light, with an energy liberation of about 200 million electron volts. Up to the present time the fission reaction is usable only as a source of heat.

This heat is harnessed in nuclear reactors by being used to make steam for power generation. In discussing reactor design, the speaker touched on a description of critical mass of the fuel, moderators, coolants, reactor control techniques, shielding and the various types of reactors. In closing, he stated that a nuclear explosion is an uncontrolled reaction such as occurs when two nearly critical masses are brought into contact at very high speed—such an explosion cannot occur in a nuclear reactor.—**Reported by A. J. Babecki for Northeast Pennsylvania.**

## A.S.M. Announces Plans For Western Metal Show

William H. Eisenman, national secretary A.S.M., has announced that the 10th Western Metal Congress and Exposition will be held in Los Angeles, Mar. 25 to 29, 1957. The Congress will be in the Ambassador Hotel, the Exposition in Pan-Pacific Auditorium.

Floor plans and general information on the twin events are being mailed from A.S.M. headquarters in Cleveland to firms which have exhibited in previous Western Shows.

In 1955 the ninth presentation of the Western Exposition drew an attendance of 53,639—mostly plant executives and engineers. It is expected that this figure will be exceeded next year.

Technical sessions of the Congress will be programmed to serve the West's greatly expanded metal industries. Papers will be delivered on selection, fabrication, application and testing of metals for war production and industrial purposes.

About 20 technical societies besides A.S.M. are expected to cooperate in the Exposition and Congress.

## Panel on Solidification Featured at Pittsburgh's Sustaining Members Night

Speakers: W. A. Tiller
G. A. Dornin, Jr., and W. H. Mayo

The sustaining members of the **Pittsburgh Chapter** were honored at a recent meeting during which a panel of three members presented several aspects of the question of "Solidification of Metals". Panel members included W. A. Tiller, Westinghouse Research Laboratories, G. A. Dornin, Jr., Shenango Penn Mold Co., and W. H. Mayo, U. S. Steel Corp.

Dr. Tiller opened the discussion with a talk on the "Theory of Solidification as Applied to Casting Problems". He listed the following requirements for good castings: They must be sound; segregation must be held to a minimum; and the ratio of equi-axed to columnar grains should be high.

Causes of chemical segregation were discussed with reference to constitution diagrams, and illustrated with a series of extraordinarily well-done slides. It was shown that there is a layer of liquid metal rich in solute at the solid-liquid interface. As freezing progresses, the configuration of the advancing face of cell boundary is modified as the cells attempt to correct for excess solute. This is never entirely successful and ultimately new cells are formed.

Mr. Dornin, who spoke on the "Effect of Design on Ingot Solidification," opened by commenting that most ingots are designed on a compromise between quality and cost. When the ingots are to be rolled, rolling economics indicate that the ingot should be relatively long and have little taper. This same shape is not necessary for forging ingots, but this factor is often overlooked.

Mr. Dornin suggested that a near-square ingot having a cross section 23 by 25 in. should be preferred over a 24 in. sq. ingot. The reason for this is that the near-square ingot will freeze 8% faster, and is just as good or better for flexibility in subsequent rolling. It was also suggested that there should be a heavier taper across the thickness of an ingot than across its width because ingots freeze from side to side and width taper is relatively ineffective. It has also been found that good results can be obtained on hot top ingots if taper is eliminated in the top portion. The length of this straight section should not exceed one half of the ingot's top thickness. This permits more metal to be poured into the ingot mold without increasing rolling time and increases the degree of taper in the lower part of the ingot.

The freezing rate at any point in an ingot may be calculated (knowing that at any other point) since the freezing rate is inversely proportional to the square of the thickness at any point in the same ingot.

Inserted clay hot tops are rapidly becoming obsolete. They have the serious disadvantages of requiring back pouring which often leads to secondary pipe and excessive nonmetallic inclusions.

Inserted composite hot tops having a metal shell with a refractory lining are much better. A good fit is required, but back pouring can nearly always be eliminated. The principal disadvantage is the relatively high investment required for shells and for facilities for relining and drying, but in the over-all inserted composite, hot tops are probably the best on the market.

Superimposed composite hot tops are excellent metallurgically, but have a serious operational disadvantage in the fit required between the ingot mold and the hot top, often resulting in hanger cracks in the ingot skin.

The final speaker, W. H. Mayo, discussed "Defects Attributed to Ingot Solidification". He classified various types of ingot defects in two ways, either as: internal, such as pipe, and external, such as slivers; or chemical, which is reflected in segregation, and physical, which would be illustrated by blisters or laminations.

The defects illustrated as the chief ones resulting from solidification were enumerated as ingotism, pipe, segregation, cracks and blow-holes. The causes and corrections for these various defects were detailed by a series of slides showing cross sections through the full-scale ingots and products, with particular reference to the effect of deoxidation practice, temperature and casting conditions on the various types of defects in killed, semi-killed, capped and rimmed ingots.—**Reported by J. A. Cameron for Pittsburgh.**

## Points Out Relationship of Metallurgy and Jet Engines

Speaker: D. C. Goldberg
*Westinghouse Electric Corp.*

D. C. Goldberg, manager of the metallurgy division, Aviation Gas Turbine Division, Westinghouse Electric Corp., delivered a lecture before the **Kansas City Chapter** on "Metallurgical Problems Involved in Jet Engines".

The importance of the metallurgist in the development and production of jet engines was stressed. He is the stumbling block to higher temperature operation by not being able to provide higher strength materials. By specific examples it was shown how he is involved in the more mundane procurement, quality control, welding, forming, machining, chemical finishing and heat treating problems.

The speaker stressed that if the lay public is to have at least equal confidence in jet engines as they have in piston engines, considerable education will have to take place. The public relations job of Rolls Royce and Capital Airlines in promoting the Viscount was cited as an excellent example.

In conclusion, Mr. Goldberg gave his audience a brief look at how the new materials—plastics, titanium, ceramics and molybdenum—will be used in jet engines.—**Reported by Mrs. Dorothy J. Juett for Kansas City Chapter.**

## Gives Talk on Mechanical Properties of Galvanized Sheet of Low Carbon Steel

Speaker: J. M. Dobson
*Bethlehem Steel Co.*

J. M. Dobson, chief inspector, sheet mill division, Sparrows Point plant, Bethlehem Steel Co., recently addressed the **Baltimore Chapter** on the "Observed Mechanical Properties of Galvanized Sheets Produced From Low Carbon Steels".

The factors which control mechanical properties were briefly reviewed and the need for careful control of processing variables was stressed.

Mr. Dobson then discussed methods of testing, including flat bend, cup, Rockwell hardness, lockseamer or lockformer, Amsler bend, stiffness, tensile and metallographic. Slides illustrating many types of testing equipment were shown.

Galvanized sheets are classified in three general categories:

1. Commercial quality and/or light-gage lockforming quality, used for such applications as air conditioning, duct work, pipe and gutter stock, roofing, etc.
2. Drawing quality for animal feeders, room coolers, electrical outlet boxes, heater parts, etc.
3. Physical quality for applications such as life boats, tubing, ship work, etc., where higher strength or stiffness is needed.

A number of tables were shown which listed the test values before and after galvanizing hot rolled and cold rolled sheets. The properties of continuously annealed and galvanized sheets were also tabulated. Schematic diagrams of the operations for pot or conventional galvanizing, batch annealing and continuous galvanizing, and continuous annealing and galvanizing were shown.

A comparison of the observed test data with the requirements for ASTM specifications covering flat rolled products shows close agreement of the mechanical properties. By altering the chemical composition of the base metal and varying the mill processing techniques, it is possible to produce galvanized sheets ranging from those that can be deeply drawn to those that will meet rather high tensile requirements.—**Reported by J. S. White for Baltimore.**

## *Highlights of Chicago-Western's Charter Meeting*

*(Left) E. E. Thum (Left), Editor of* Metal Progress, *Is Shown Presenting the Charter of the Chicago-Western Chapter to Carl E. Swartz, Chairman of the. Newly Formed Group. The presentation was made at the dinner meeting during which A. B. Kinzel, vice-president, Union Carbide & Carbon Research Laboratories, spoke on "Research and Trends in Metallurgy"*

*(Right) Lonnie L. Abernethy, Ceramics Group, Metallurgy Division, Is Shown Explaining the Operation of the Interferograph to the Study of Ceramic Materials to a Group of Chicago-Western Members Who Toured the Argonne National Laboratory During the Recently Held All-Day Meeting Which Was a Feature of the Chapter's First Meeting*

## New Developments in Speciality Steel Mills Outlined at Montreal

Speaker: H. G. De Young
*Atlas Steels Ltd.*

At a meeting of the **Montreal Chapter,** H. G. De Young, executive vice-president, Atlas Steels Ltd., presented a talk entitled "Pioneering in New Developments in a Specialty Steel Mill".

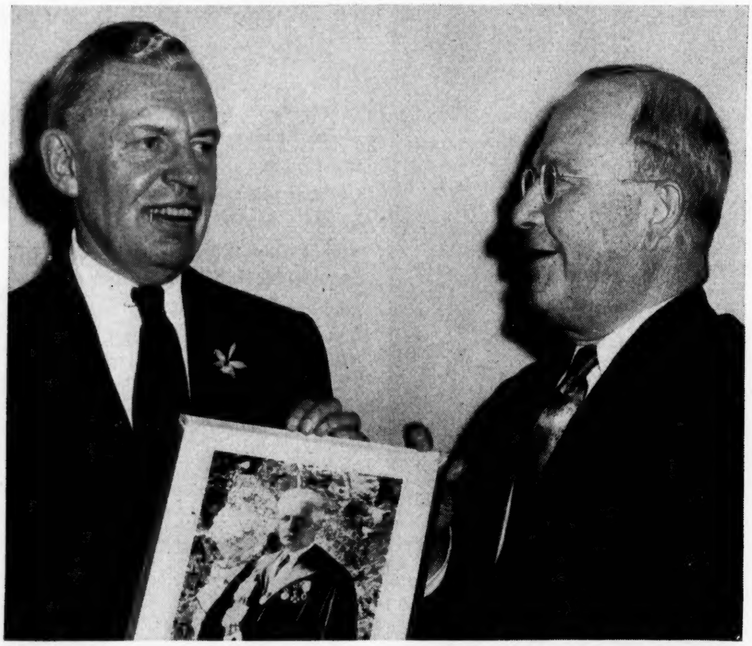
Mr. De Young outlined the development and early operation of a Koppers continuous casting machine capable of handling slabs up to 21½ x 5½ in. Complete surveys of temperature were carried out throughout the equipment, and experimental runs were put through with all variables adjusted to give optimum results. Investigation and subsequent modification took place in the layout of the shop in the area of the machine, in tapping and ladling techniques, in the protective atmosphere system, in the casting rates, in the cooling and lubricating systems and in handling methods after casting. The end result is the production of mild, low alloy and corrosion resistant steel products with excellent homogeneity and controlled chemistry, low in inclusions and free of segregation. It is estimated that the over-all machine costs break even when the machine is running at one-third capacity.

Other units associated with the continuous casting production line are a Linde powder scarfing machine, a Sendzimir planetary mill and an electrolytic descaling set-up using Kolene salt. The scarfing machine has been greatly developed but improvement is still being sought in the life of heads (nozzles). The planetary mill was installed in place of a continuous mill line, since the cost of the latter was not thought to be justified for the production involved. The planetary mill is equipped with hot force feed rolls, and two back-up rolls mount the planetary system with 48 rollers in each cage. The descaling operation is handled in two tanks with the electrodes positive in the first and negative in the second on a 36-volt, 5000-amp. system. The tanks are maintained at a temperature of 900° F. The mill products are descaled to a bright finish and annealed in one continuous operation.

Mr. De Young gave details of a check on the continuous casting line which showed a ratio of melt weight to finished mill product weight of 88.4 against 77% under the previous "mold" casting method, based on a cold melt weight of 51,000 lb.—**Reported by Rafe Sherwin for the Montreal Chapter.**

**A. S. M. has produced and makes available for showing before chapters and educational institutions, moving picture films pertaining to metals.**

# Presented Sauveur Award in Boston



*John T. Norton, Professor of Physics of Metals, Massachusetts Institute of Technology, Is Shown (Left), Receiving the Award for the Sauveur Memorial Lecture Which He Presented to the Boston Chapter. Shown with Dr. Norton is Horace T. Ross, chairman of the Sauveur Lecture Committee. Dr. Norton spoke on "Metal Progress in the Post-Sauveur Era". Since this talk will appear in a future issue of* Metal Progress *in its entirety, it will not be given here. (Reported by W. H. McCarty for Boston)*

## St. Louis Holds Annual Stump the Experts Night

Following a plant tour of the brass rolling mill of Olin Mathieson Chemical Corp., members of **St. Louis Chapter** limbered their wits on fellow members in a "Stump the Experts Night" meeting.

Prizes were offered for the first three questions that would successfully stump the experts. Three did, and were awarded their prizes despite the good-natured cry of "foul" from the experts.

Members of the panel included: John H. Culling, Carondelet Foundry Co.; Harvey Gillerman, St. Louis Car Co.; Karl Kaveler, United States Defense Corp.; Irving Rozalsky, Shell Oil Co.; and Donald Zimmerman, Owens Illinois Glass Co.

George A. Fisher, Jr., International Nickel Co., acted as moderator, and Leonard Gulbransen of Washington University acted as judge.

Questions covered a great variety of subjects from ferrous to nonferrous, from resistance welding to the heat treatment of toolsteel. This annual panel discussion is a favorite with the Chapter members because each has an opportunity to question and discuss a phase of metals with which he is primarily concerned.—**Reported by Robert D. Leslie for St. Louis Chapter.**

## Points Up Factors Which Affect Machinability at Calumet Chapter Meeting

Speaker: A. G. Sturrock

*Wyckoff Steel Co.*

An excellent talk entitled "Metallurgical Factors Affecting the Machinability of Steels" was given by A. G. Sturrock, manager, metallurgical division, Wyckoff Steel Co., at a meeting of the **Calumet Chapter.**

Mr. Sturrock stated that while the effect of sulphur in promoting free machining properties has been known since 1879, it is only comparatively recently that the true function of the sulphide inclusion has been known. Rather than acting as a chip breaker it was found that, in cutting steels containing sulphur, the sulphides tend to smear on the tool face thereby interposing a nonmetallic interface with lower coefficient of friction between the tool and the chip. Since the "short, lumpy" or lens-shaped sulphide inclusions offer a greater area of contact with the tool face, steel with this type of sulphide inclusion has been shown to machine better than steel in which the inclusions are in the form of elongated stringers. The difference in the shape of the inclusions may be attributed to a higher range of plasticity for the lens-shaped or so-called globular type of inclusion.

While free machining steels should be relatively soft, they should also be brittle or have the property of becoming brittle with the plastic deformation involved in machining.

The bessemer steels, due to their inherent phosphorus and nitrogen content, have the requisite properties for free machining. The screw stocks produced by the openhearth or electric furnace process require additions to bring the phosphorus up to about 0.09% and nitrogen up to at least about 0.010%.

Lead in steel has a lubricating effect similar to that of sulphur but unlike sulphur the lead does not smear on the tool face but is found to be smeared on the chip. Slides were shown of chips etched to show lead and, by comparison with photomicrographs of the workpiece, it could be seen that the lead seems to be squeezed out of the surface and smeared on the chip to form a metallic interface of lower coefficient of friction between the chip and the tool.—**Reported by T. W. Howlett, Jr., for Calumet Chapter.**

## New Films

### Manufacturing Reinforced Plastics

A documentary film about the plastics industry which shows many modern-day uses of fiberglass reinforced plastics in the auto and aircraft industries and by boat builders and sports equipment manufacturers, produced by the Carborundum Co., may be obtained through Association Films, Inc., Broad at Elm, Ridgefield, N. J., or 351 Turk St., San Francisco, Calif. This 13½ min., full-color film also shows the role of abrasives in the sanding, trimming and finishing of countless plastic operations.

### Always on the Job

Air Reduction Sales Co. has produced this 20-min., sound, slide film covering the basic principles of safety in electric arc-welding. It is available from any Air Reduction Sales Co. office on a free-loan basis, or may be purchased for $15.

### Vacuum Melting

A color film on vacuum melting of alloys is available for distribution from the Metals Division of Utica Drop Forge & Tool Corp., Utica, N. Y. The 17-min. film traces the complete process of vacuum melting, beginning at the conference table where the melt content is discussed, and proceeding from test melt on to the finished product.

## Points Out Value of TTT Curves in Heat Treating At Indianapolis Meeting

**Speaker: A. E. Nehrenberg**
***Crucible Steel Co. of America***

At a meeting held by the **Indianapolis Chapter,** A. E. Nehrenberg, supervisor of the research laboratory, Crucible Steel Co. of America, presented a talk entitled "TTT Curves in Practical Heat Treatment".

Mr. Nehrenberg defined heat treatment as a combination of heating and cooling operations, timed, and applied to a metal or alloy in the solid state in a way that will produce desired properties.

TTT curves or graphs are convenient means of showing the time required for austenite to begin and to finish transforming at any temperature level below its range of stability. Thus, the TTT graph or curve may be regarded as a type of working diagram that lets one visualize or approximate how the steel will behave and what structural changes will take place when it transforms from the austenite state.

Certain alloying elements or combinations of elements change the form of a curve. Generally speaking, an increase in alloy content or in the grain size always retards transformation.

The greatest usefulnes of the curve lies in the over-all picture that it presents of the transformation behavior of austenite.

Products formed from austenite include: ferrite, which is soft; pearlite, soft to medium hard; intermediate products, medium hard; bainite, hard; and martensite, very hard.

Martensite is formed during cooling and the $M_s$ point or start of martensite formation is marked on the curves.

The difficulty in using these curves is that the heat treater seldom works isothermally. How these curves can be used to predict transformations which occur during continuous cooling was discussed.

Mr. Nehrenberg presented slides showing the development of TTT curves, TTT curves for various steels, and annealing curves for various steels.—**Reported by Dorothy Holbrook for Indianapolis.**

## Present Gift to Long-Time Secretary

*Roy C. Raymond (Left), and Maur J. Weldon, Chairman of the New Haven Chapter, Are Shown During the Presentation of a Matched Set of Luggage to Mr. Raymond in Appreciation of His Long Years of Service as Secretary of the Chapter. Mr. Raymond is retiring due to pressure of business activity*

## Reviews History of Shipbuilding in Canada

**Speaker: O. H. Barrett**
***Canadian Vickers Ltd.***

O. H. Barrett, president, Canadian Vickers Ltd., presented a talk on the "Shipbuilding Industry in Canada" during a meeting held in **Montreal.**

Mr. Barrett stressed the present association between the shipbuilding and the metals industry, and traced the history back to the days of wooden ships. The first ship built in Canada dated from the early 1600's, followed by development up to 1750 when a 72-gun ship-of-the-line was constructed. By 1880, the day of the "ironclads" had come, but failure to meet the challenge of steam and industrialization brought a recession to the yards.

During the first world war, the industry expanded rapidly and the boom continued until 1926. A second decline followed, until the onset of the second world war. From 1940 to 1945, Canada produced 4853 ships. Production continued steadily after the war until 1953, during which period a revitalization program was undertaken by the Navy, and destroyer escorts of the most advanced design were built. Since 1953, the industry has suffered a steady and serious decline.

Mr. Barrett pointed out that Canada is unable to compete in foreign shipping markets because of the high cost of labor and materials, hence the present poor position of the industry. In the domestic market, Mr. Barrett put in a claim for Canadian monopoly in the coasting trade, which carries 30,000,000 tons of cargo per year. He felt that this would not interfere with other interests and that it would enable the shipbuilding industry to operate at a steady level.

The Gordon Sproule Memorial Scholarship, donated by the Montreal Chapter, was presented to Michael J. Colman, a student at McGill University, during this meeting. Gordon W. Smith, also of McGill, received the A.S.M. Scholarship.—**Reported by Rafe Sherwin for Montreal Chapter.**

## OBITUARIES

CHARLES R. AUSTIN, 58, assistant to the president, Meehanite Metal Corp., died May 31 after a brief illness. Born in Manchester, England, Dr. Austin held a B.S. and M.S. degree in science technology and a Ph.D. degree in philosophy. He was a fellow of the Royal Institute of Chemistry of Great Britain.

Dr. Austin served as chairman of the National Educational Committee of A.S.M. and had published more than 50 papers on metallurgy, engineering and allied subjects. In 1946 he was awarded the Henry Marion Howe Gold Medal for the paper judged of highest merit by A.S.M. Subsequent to his association with the National Physical Laboratories of London, Dr. Austin was in charge of metallurgical research for National Tube Co., and later served as section engineer for Westinghouse Electric Corp. In 1934 he joined the staff of Penn State College, where he developed and directed a cooperative program of research in metallurgy in association with several well-known steel companies and allied metallurgical industries. He resigned his professorship in 1945 to join Meehanite as director of research.

♦ ♦ ♦

A. D. BEEKEN, JR., died recently of a heart attack. He was vice-president in charge of sales for Vulcan Crucible Steel Division, H. K. Porter Co. Mr. Beeken was born in 1891 in Fanwood, N. J., and was a graduate of Carnegie Institute of Technology. He had been associated with Vulcan for 42 years and was a member of the Pittsburgh Chapter.

## Presents First 25-Year Certificate


*A 25-Year Certificate Was Presented to Maurice C. Fetzer (Left) by Amon Groves, Chairman, at a Meeting of the Inland Empire Chapter. Mr. Fetzer is head of the physical metallurgical section, Division of Metallurgical Research, Kaiser Aluminum and Chemical Corp. This was the first such award to be presented by the Inland Empire Chapter. (Reported by G. Fergin)*

## Springfield Holds Panel Discussion on Materials, Heat Treat, and Finishes

Members of the **Springfield Chapter** enjoyed the excellent Westinghouse film presentation on atomic energy, "Dawn's Early Light", followed by a panel discussion on "Materials, Heat Treatments and Finishes" at a recent meeting. The panel members were Robert Grace, L. S. Starrett Co., Carl Keyser, University of Massachusetts, Paul Farren, Hartford Machine Screw Co., Inc., Henry Langston, Springfield Armory, Paul Lyman, Millers Falls Co., and Arthur Zavarella, Springfield Armory.

One discussion concerned rhodium plating and the reasons for its use. Rhodium plate is very corrosion resistant, rhodium being a precious metal. It is also hard and wears well, has high light reflectivity and does not tarnish as does silver. It is frequently plated on silver electric contacts.

Electroless nickel was also discussed at some length. Nickel deposited in this way has a Vickers hardness of 1000-1100, can be deposited directly on aluminum without previous surface treatment, and covers the part being plated with a uniform thickness regardless of the shape of the part. Among its limitations is its poor adhesion to some types of steel and the requirement for good control of bath make-up, pH, temperature and concentration of reducing agent in the bath. The nickel will deposit on dirt particles in the bath and hence continuous filtration is required. The method is particularly useful for plating shapes in which insertion of an anode for conventional electroplating would be difficult or impossible.

The subject of copper plating of parts to be carburized, as well as parts in which decarburization is to be prevented, was discussed in detail. Copper for these applications must be slowly deposited on a clean surface for maximum adhesion and density to be achieved. Double plating is sometimes used, probably because the second layer deposited tends to seal off interdendritic voids, which otherwise would run from the surface to the basis metal. Double plating thus provides a denser coating and better protection.—**Reported by C. A. Keyser for Springfield Chapter.**

## Increase Value of A. S. M. Foundation Fellowship

The total value of the A.S.M. Foundation Fellowship for advanced study in metallurgy has been increased. Beginning this year (1956-57), the Fellowship winners will receive the full Fellowship Grant ($2400 if single; $3000 if married) for two consecutive years. The second year's grant will be contingent upon a maintenance of the winner's scholastic standing. The value, therefore, will be $4800 for the winner if single; $6000 if married. The school selected by the winner will also receive $1200 each year for tuition and other expenses. An essential provision of the A.S.M. Foundation Fellowship is that the winner have at least one full year of experience in industry or nonacademic research since receiving his B.S. degree, and that he be not over 27 years old on Sept. 1 of the year in which the Fellowship begins.

The current Fellowship winner is Glenn Wilson Bush (A.S.M.), a graduate of Penn State, whose industrial experience has been with the Allegheny Ludlum Steel Corp. Mr. Bush plans to use the Fellowship at Penn State.

Last year's winner was William Upthegrove, graduate of University of Michigan, where he returned for his graduate studies last September.

## Student Granted A. S. M. Scholarship

*National President A. O. Schaefer, Director of Research, Midvale-Heppenstall Co., Presented Herbert E. McCoy, Jr., a Junior in Metallurgy at the University of Tennessee, an A.S.M. Scholarship During a Meeting of the Oak Ridge Chapter at Which He Gave a Talk on "Forged Pressure Vessels"*

## *Details Industrial Uses for Titanium*


*George T. Fraser (Right), Western Sales Manager, Rem-Cru Titanium, Inc., Gave a Talk on "Industrial Applications of Titanium" at a Meeting of the Inland Empire Chapter. He is shown with D. S. Bennett, program chairman*

Speaker: George T. Fraser
***Rem-Cru Titanium, Inc.***

At a recent meeting of the **Inland Empire Chapter,** George T. Fraser, western sales manager, Rem-Cru Titanium, Inc., owned jointly by Remington Arms Co., Inc., and Crucible Steel Co. of America, described the "Latest Industrial Applications of Titanium". The talk was illustrated by slides and fabricated titanium samples.

Although the element titanium was discovered approximately 150 years ago, the first titanium metal to be produced commercially was by Remington Arms Co. in 1948. In August 1950, Remington joined with Crucible Steel Co. of America to form the Rem-Cru organization. At that time the size of the titanium ingot produced was 25 to 30 lb. Ingot size continued to increase until 1952, at which time Rem-Cru was producing 4000-lb. titanium ingots.

Titanium sponge bought from du Pont de Nemours & Co. is melted in a vacuum furnace at 3150° F. in an argon atmosphere to produce these ingots. Grain refinement of the ingot is carried out by hot working between 1300 and 1800° F.

Melting capacity is the present bottleneck in ingot production by the titanium industry. According to Mr. Fraser, approximately 6500 tons of titanium may be required this year while the industry capacity may reach 5000 tons. Prices for titanium bar presently run at approximately $11 per lb., with sheet prices at $16 to $17 per lb., f.o.b. mill.

A slide presentation illustrated many reasons for the use of titanium in both military and nonmilitary uses. Aircraft jet engines demand a high strength-weight ratio at high temperatures without creep. Future aircraft flying at Mach 3.5 will require considerably more titanium. Airplane nacelles provide for the largest nonmilitary use of titanium.

The corrosion resistance of titanium is considered to be the highest of the common metals and alloys. Many problems are encountered when heat treating titanium, since only a 15,000 psi. spread is found between yield and ultimate strength. Stretch forming and deep drawing must be performed at elevated temperatures, otherwise no forming takes place.

Among his samples, Mr. Fraser circulated a hip pin for application in bone surgery. Other samples included a machined valve, elbow and shims.

In a question and answer period following the address, Mr. Fraser explained that the weldability of commercially pure titanium is comparable to that of stainless steel, providing a protective atmosphere of argon or helium is maintained about the weld area. Titanium alloys are being developed which will lend themselves to welding.

Mr. Fraser presented this same talk at a meeting of the **British Columbia Chapter** in his tour of the Northwest Circuit.—**Reported by G. S. Fergin for Inland Empire.**

## Pennsylvania Chapters Schedule Biennial Meeting

The Tenth Biennial Pennsylvania Interchapter Meeting of the American Society for Metals will be held at University Park, Pa., on Friday and Saturday, Sept. 7 and 8, 1956, under the auspices of the Penn State Chapter. The department of metallurgy of Pennsylvania State University will be host along with the chapter. The technical meetings will have as their theme: "Vacuum Melting and Casting as Metallurgical Operations". Outstanding speakers will present the papers on which discussions will be based. Complete programs can be obtained by writing to the Department of Metallurgy, Pennsylvania State University.

In addition to the host chapter, Lehigh Valley, Northwest Pennsylvania, Northeastern Pennsylvania, Philadelphia, Pittsburgh and York Chapters are participating in the meeting.

All members of the participating chapters will receive housing reservation cards about two months before the meeting and others may obtain them by writing to H. M. Davis, Professor, Division of Metallurgy, Pennsylvania State University, University Park, Pa.

## *Discusses Failures Under Static Stress*

*George Sines (Left), Institute for the Study of Metals, University of Chicago, Who Spoke on the "Failure of Materials Under Combined Repeated Stresses With Superimposed Static Stresses" Is Shown With Heinz F. Poppendiek, a Member, at a Recent Meeting Held by the Oak Ridge Chapter*

# A.S.M. Science Achievement Awards

## —Some Facts About This Year's Program

FROM EVERY STATE, the District of Columbia, from Panama, Puerto Rico and Canada, 2113 young junior and senior high-school students in public, private and parochial schools completed all kinds of science projects and submitted them to regional judging committees in the 1956 A.S.M. Science Achievement Awards program.

It was not alone a program of size; the results have permanently recorded it as an important undertaking, with outstanding benefits.

Of the 2113 entries mentioned, 68 were special projects or investigations covering the field of metals. These special entries were judged by a select committee of scientists and researchers—after they had been considered by the regional groups. In many instances, two awards were made, one for the best in the regional classification and also the special metals award of $100 in U. S. bonds. Twenty winners were declared in the $100 special metals category.

A total of 1056 young students, from grades 7 through 12, received recognition, 140 being awarded U. S. bonds. The remaining winners received certificates of merit and achievement.

The winning entries in the 1956 Science Achievement program represented a total of 135 different schools. Special Award Plaques were prepared and sent to each of these schools. A total of 304 schools in 43 states, the District of Columbia, Panama, Puerto Rico and Canada received citation awards.

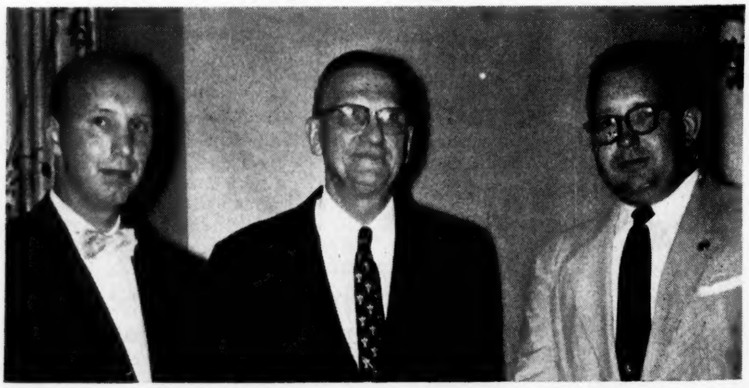
In carrying forward the administrative details of this year's A.S.M. Science Achievement Awards, the Future Scientists of America division of the National Science Teachers Association sent out 65,600 announcements and 22,816 entry cards and personal data sheets. Many A.S.M. chapters also distributed announcements in their localities.

It is believed that over 100,000 students, teachers, career counselors, school principals and school officials were keenly aware of the A.S.M. Science Achievements Awards program this year. The high point of the program has been the award ceremonies, where entire school enrollments have witnessed the presentation of U. S. bonds, certificates, plaques and special awards.

A.S.M. has been ably represented at each of these ceremonies through the splendid efforts of its chapters, working closely with the science teacher responsible for the contestant's planning of his or her research and the final organization of material. A great deal of interest, attention and work has been given by the chapters to the entire program.

Credit is also deserved by the scores of individuals who have given freely and willingly of their time to serve as judges in the various regions and who have contributed so much toward the program's success. Their time and effort have given the awards program the needed factor of local interest and pride without losing the larger national interest of the Society.

## Talks on Engineering as a Career



*From Left: D. A. Douglas, Incoming Chairman; Harold L. Maxwell, Sectional Supervisor of the Mechanical Engineering Consultants, E. I. du Pont de Nemours & Co., Inc., Who Spoke on "Engineering and Jobs—Adapting One to the Other"; and W. J. Fretague, Retiring Chairman, Are Shown During a Meeting Which Was Held Recently by Oak Ridge Chapter*

Speaker: H. L. Maxwell

*E. I. du Pont de Nemours & Co., Inc.*

"Engineers and Jobs — Adapting One to the Other" was the title of an address given by H. L. Maxwell, E. I. du Pont de Nemours and Co., Inc., at a meeting in **Oak Ridge**.

Dr. Maxwell stated that the association of an engineer and his job constitutes, in essence, human relations in industry. He then listed some qualities which are found in men who are consistently advancing, including: Persistence; co-operation; initiative (Dr. Maxwell made the point that there is a difference between initiative and aggressiveness; a strong offensive is not a good substitute for courtesy and diplomacy); realistic acceptance of disappointments and successes (a sign of maturity and stability in a man is his ability to make disappointments and successes temporary and relative); and leadership, which comes naturally to a man who respects people and what they are. Dr. Maxwell drew on his experience in dealing with engineers to accent the above factors.—**Reported by Charlie Brooks for Oak Ridge Chapter.**

## A. S. M. Lecturers Visit Nine Schools This Year

Nine Visiting Lectureships were completed this year, the fourth consecutive year in which A.S.M. has underwritten the costs of visiting lecturers to various engineering schools.

To have a request for a visiting lecturer approved, the applying school must state that its financial budget is not adequate for such special activities. Upon approval of a visiting lectureship application, A.S.M. invites the requested lecturer and pays his expenses to the applicant school's campus and return to the lecturer's own school or home.

The 1956 A.S.M. lectureship schedule included: B. L. Averbach, Massachusetts Institute of Technology, lectured at the University of Pennsylvania; J. U. MacEwan, McGill University, lectured at Nova Scotia Tech; E. E. Stansbury, University of Tennessee, lectured at the University of Cincinnati; L. M. Pidgeon, University of Toronto, lectured at Missouri School of Mines; W. S. Pellini, U.S. Naval Research Laboratory, lectured at the University of Wisconsin; and Walter Boas, Australian scientist and Harvard lecturer, filled a lectureship request from Illinois Institute of Technology; Morris Cohen, Massachusetts Institute of Technology, lectured at Notre Dame; Bruce Chalmers, Harvard University, filled two invitations, one at University of Minnesota and one at Penn State.

## Describes How Statistics Can Benefit Research and Industry at Washington

Speaker: W. J. Youden
***National Bureau of Standards***

At the Past Chairmen's Night meeting held by the **Washington Chapter,** William J. Youden, National Bureau of Standards, spoke on "Statistics in Research and Industry".

Dr. Youden stressed the necessity of having the statistician take part in planning the experimental program for a given project. The statistician, like the architect, makes his best contribution when he is consulted early in the planning of the work. To illustrate his point, Dr. Youden cited several practical problems which may confront the metallurgist and worked out efficient procedures for making tests and experiments.

He then discussed the problem of detecting significant trends in a group of measurements. By relating differences of successive measurements to differences of the measurements from the over-all average, a trend can be easily detected.

The talk was concluded with the discussion of the problem of selecting the best item of several on the basis of results of a single test of each item. Dr. Youden described what the relationships of these test results should be in order to be able to make a valid selection.

Prior to the technical meeting, Harry K. Hirschman, a past chairman, gave a brief report on the founding and early history of the Washington Chapter. He related several anecdotes which revived fond memories among many of the members.—**Reported by H. P. Weinberg for Washington.**

## A. S. M. to Participate in Summer Career Workshops

In cooperation with the Engineering Council for Professional Development, and with the help of the Engineering Manpower Commission and the Scientific Manpower Commission, A.S.M. is participating in 150 summer workshops for high-school guidance counsellors throughout the country.

E.C.P.D. has organized the details of the various workshops and is providing a printed list of career leaflets and booklets which will be available during the workshop sessions. A.S.M. will provide the career leaflet, "Does Engineering Appeal to You", and the 95-page booklet, "Your Career in the Metallurgical Profession".

Some of the leaflets in the nonmetallurgical field will carry a nominal charge, others will be gratis. Both A.S.M. career items will be free of charge when properly requested.

## *Pittsburgh Tours Babcock & Wilcox*

*Members of the Pittsburgh Chapter Who Toured the Tubular Products Division of Babcock & Wilcox Co., Included, From Left: Gustave Pletz, B & W Guide; T. I. McClintock, Chairman; H. W. Paxton, Vice-Chairman of Student Affairs Committee; and Gilbert Solar, Chairman, Meetings Committee*

During a recent meeting of the **Pittsburgh Chapter,** a tour was made of the Babcock and Wilcox Co.'s plant at Beaver Falls, Pa.

Members of the chapter inspected the manufacturing processes at the plant, starting in the electric furnace department, where there are four large electric furnaces currently being used, with heats ranging from carbon to stainless steels. The heats are poured into ingots, routed via the stripper and soaking pits to the forging hammer or press, and, after forming, the blooms are reheated and rolled into rounds and cut to length for extrusion or further working.

The hot mill department consists of four piercing mills which produce tubing from the billets by means of forming rolls and piercing rams. The roughly formed tubing goes through a plugging operation, followed by reeling and sinking. The tubing may be further finished by cold drawing or Roto rocking equipment. A thorough cleaning and inspection precedes final packaging for shipment.

B & W has used the extrusion process under French license since 1950. This process, using glass as a lubricant, makes possible the economical production of both intricate shapes and quality tubing. The product being extruded at the time of the tour was stainless tubing. Stainless extrusion starts with a polished billet which is heated in a rotary furnace, and lubricated for initial piercing. The pierced billet is then induction reheated for final extrusion. This operation requires a 500-ton hydraulic press which produces a length of tubing quite uniform and requiring very little further finishing to become a quality product.

Quality of product in this plant is maintained by a modern laboratory. A type of heat analysis is used whereby the melter can have test results minutes after the sample has been taken from the furnace. Other tests are conducted on a par of excellence with this up-to-date method.

After the tour, a dinner meeting featured a talk by W. J. Thomas, vice-president of Babcock & Wilcox. He reviewed the growth and progress of the tubing industry and the part his company plays in that field. While widely diversified, Mr. Thomas pointed out that all branches of the company are somehow related to the manufacture or use of tubing. In the largest branch, the boiler division, work is now under way on a boiler capable of 4500 psi. of steam pressure at a temperature of 1100° F. Entirely new concepts of manufacture and testing had to be devised to build such a generator. Because of this, it is not strange that of the 18,500 employees, 2300 are scientists and engineers. This is indicative of the research and control that is being performed.

Mr. Thomas stated that total production of the tubing industry is 10 million tons per year or 125 lb. for every person in the United States.

The future of the tubing industry was indicated by Mr. Thomas when he asked for better method of transporting gas or liquid.—**Reported by John T. Howat, Jr., for Pittsburgh.**

**As an indication of the tremendous dissemination of engineering information, a compilation shows that in one year the A.S.M. collected, edited, published and distributed over *one hundred million pages* of metallurgical information.**

# *Jeffries' Night Held in Cleveland*

*C. H. Junge, Cleveland Chairman, Is Shown Presenting the Zay Jeffries' Night Plaque to T. K. Glennan (Left), President, Case Institute of Technology, During a Recent Meeting. Dr. Glennan presented a talk entitled the "Impending Shortage of Specialized Talent in the United States"*

Speaker: T. K. Glennan
***Case Institute of Technology***

At the traditional meeting of the **Cleveland Chapter** in honor of their internationally famous founder member, Zay Jeffries, T. Keith Glennan, president, Case Institute of Technology, saluted him as the man whose wisdom has helped so many. It was fitting that the subject for Dr. Glennan's talk, the "Impending Shortage of Specialized Talent in the United States", should be a problem that both Dr. Jeffries and he have been actively working to alleviate.

According to Dr. Glennan, the nation is finally aroused to the seriousness of the shortage of specialized talent but, although the shortage may be resolved eventually quantity-wise, quality may still be a problem. The tremendous mechanical progress that the nation is enjoying today is due to organized effort on the part of groups led by specialized talent. In the great labor force of 65 million, this small group of engineers, doctors, executives and teachers, numbers only 8%, yet this group plays an important part stretched thinly over our expanding economy. Automation requires trained and educated men to run it. The era of the common man has produced too many common men. In order for this nation to keep pace with the rapid progress being made by other countries, we must make sure that an increasing proportion of the *ablest* youth be encouraged to get a college education. Engineers are required to solve problems every day that would have given Isaac Newton trouble.

Dr. Glennan warned that the standards of excellence required for tomorrow's specialized talent will suffer due to the serious teacher shortage. This shortage extends from the first grade up, which weakens the whole educational structure just when it is needed the most. High schools are dropping science, language and mathematics courses due to the scarcity of specialized teachers. Above average students are often stifled by mass education which is just trying to maintain the pace of the average man. Yet there is no relief in sight and in 15 years, twice the number of teachers will be needed in colleges alone.

Recognition of this problem may lead to some solutions. One solution that Dr. Glennan described is direct competition by the schools with industry in procuring teachers from our educated manpower. Otherwise, in the end, all will suffer. Salaries, advancement, community prestige must be promoted Apprenticeships, internships, and fellowships to encourage students who show an inclination to teach must be offered before they get away from the schools.

However, as Dr. Glennan said, this is only one solution for a problem that everyone must help solve. And this is not the time to "let George do it!"—**Reported by J. J. Glubish for Cleveland Chapter.**

## German Society Invites Americans to Foundry Show

The Verein Deutscher Giessereifachleute has issued an invitation to all members of the foundry industry of all countries to participate in the 23rd International Foundry Congress to be held in Dusseldorf from Sept. 1 through Sept. 9, 1956. Simultaneously with the Congress, Verein Deutscher Giessereifachleute (VDG), Wirtschaftsverband Giessereiindustrie (WGI), Fachgemeinschaft Giessereimaschinen im VDMA and Gesamtverband Deutscher Metallgiessereien (GDM) are organizing an International Foundry Trades' Fair—GIFA. The Fair grounds at Dusseldorf, comprising six large buildings with an area of 42,000 sq. m. available for exhibition purposes, will be completely made use of by home and foreign exhibitors.

The Fair program comes under the following headings: (1) Products of the iron, steel, malleable cast iron and metal foundries; (2) foundry machinery and plant; (3) raw and auxiliary materials for foundries; and (4) technical, scientific and historical special exhibitions. Many members of the foundry industry will remember the last Congress, held in Germany 20 years ago, also in Dusseldorf, which, although much of the war damage is still visible, is still a city of the Arts, of gardens and of fashion. There are also extensive new plants and buildings expressive of renewed life and high ambition to prove that Dusseldorf is constantly developing, both in the economic and the cultural sense, as never before.

Dusseldorf, as the spiritual center of the North Rhine district and of Westphalia, is the home of the administrative offices of the great industries of the Ruhr and of many bodies and institutes serving a widespread economy and culture. No one who lives within its walls can remain insensitive to the radiant and highly individual wave-frequencies sent out by its economic, intellectual and artistic activities and pulsing life. It is in these aspects of Dusseldorf that the reason may be sought why the representative bodies of the foundry industry have chosen it as their operational headquarters. For several years now the Wirtschaftsverband Giesserei-Industrie and the Verein Deutscher Giessereifachleute have occupied joint offices in the newly built Haus der Giesserei-Industrie, which has been enlarged by the addition of the Institut fur Giessereitechnik, the Institute of Foundry Technique.

The Congress lecture program has been condensed to two days. Simultaneous translation installations will be provided to reach as wide as a number of hearers as possible. During the three days on which there are no lectures, there will be numerous plant visits.

The three post-Congress tours are intended to afford visitors from abroad the opportunity of getting to know the German scene and her towns. At the same time, there will be a wide choice of well known industrial concerns to be seen, and it is hoped that this will prove a stimulating experience to the visitor and enable him to gain an insight into Germany's activity in industry. Ample plans are being made to formulate an interesting ladies program.

## British Columbia Completes Successful Education Course

Under the auspices of the **British Columbia Chapter,** one of the most successful educational courses in recent years was held in Vancouver during the first two weeks in April, when talks on "Tests and Measurements", "Heat Treatment", "Radiography of Welds", and "Surface Finishes" were presented.

Experts in the respective fields dealt with each subject, first in the form of a lecture and secondly by demonstrations and discussions to illustrate practical applications. This method of combining theory and practice proved extremely popular with the large number of members and guests who enrolled in the course. The companies who provided the facilities for the lectures and demonstrations also allowed members to see the other productive activities of their plants and this contributed greatly to the interest and success of the course.

The British Columbia Chapter is much indebted to the following for giving their services as lecturers and for granting permission to visit their plants:

University of British Columbia, W. Armstrong

Industrial Engineering Ltd., Roy Taylor

Dominion Bridge Co., W. Shand and panel of experts

Bristol Aircraft Co., Messrs. Dow and Churchyard

**—Reported by J. S. Logie for British Columbia Chapter.**

## A.S.M. Foundation Readies Fourth Scholarship Program

The American Society for Metals, through its Foundation for Education and Research, has granted 139 scholarships of $400 each to engineering students who have chosen metallurgy as their professional career during the past three years. These scholarship winners are at the top of their class standing. They will be a vital part of industry's future because they will be well trained and well adapted to the development of new metals and metal combinations necessary to the continued progress in this engineering field.

The fourth annual scholarship program in which 53 engineering schools will participate is now being readied by the A.S.M. Foundation. They will provide, upon their graduation, another group of metallurgists of special ability for the important jobs yet to be done.

For the first four years of these scholarships in all qualified schools, (private, public and parochial in the United States and Canada) the A.S.M. Foundation has appropriated a total of $76,400.

## *At New England Regional Meeting*


*Guests of Honor at the Recently Held New England Regional Meeting Included, From Left: National President A. O. Schaefer, Director of Research, Midvale-Heppenstall Co.; Arthur Nutt, Vice-President of the Lycoming Division, Avco Manufacturing Corp., Who Spoke on the "Economic Application of Quality Control in Aircraft Engine Manufacture"; National Secretary W. H. Eisenman; and Maur Weldon, Chairman of the New Haven Chapter, Which Was the Host Chapter. (Reported by Kenneth L. Tingley)*

## *Oak Ridge Honors Its Past Chairmen*

*Past Chairmen of the Oak Ridge Chapter Were Honored at a Meeting Which Was Held Recently. They are shown with National President A. O. Schaefer, Midvale-Heppenstall Co. (second from right, front row). Mr. Schaefer presented a technical talk entitled "Forged Pressure Vessels"*

## *Schaefer Is Guest at Jacksonville*

*National President A. O. Schaefer, Director of Research, Midvale-Heppenstall Co., Talked on the "Applications of Emergency Metallurgy to Peacetime Work" at a Meeting Held in Jacksonville. At the head table are, from left: Mr. Schaefer; Harry J. Huester, program chairman; Mrs. Schaefer; Chairman and Mrs. Joe Campbell; and Captain and Mrs. Tom Tyra*

## Chapter Panel Pinch-Hits for Speaker


*Members of the Los Angeles Chapter Who Presented a Panel Discussion on "Metals for High-Temperature Service" Included, From Left: F. S. Boericke, Chairman, Attendance Committee; Graham Hall, Member; J. E. Wilson, Secretary; B. L. Molander, Member; and Ralph L. Wilson, Director of Metallurgy, Timken Roller Bearing Co., Guest of the Chapter That Night*

A panel composed of **Los Angeles Chapter** members pinch-hitted for the scheduled address by Alan V. Levy at the final technical meeting of the year. Mr. Levy, supervisor of materials and process for Marquardt Aircraft Co., was unable to present his discussion of "Performance of Materials at Elevated Temperatures for Aircraft and Guided Missile Application" due to government security regulations.

Discussing "Metal for High-Temperature Service", the panel, moderated by technical chairman John E. Wilson, district manager of Climax Molybdenum Co., included Frederic S. Boericke, district sales manager, Haynes Stellite Co.; Graham Hall, sales manager of Armco West Coast; Blair Molander, supervisor of metallurgical laboratory for North American Aviation; and Ralph L. Wilson, director of metallurgy for Timken Roller Bearing Co., and past president A.S.M.

Beginning the series, Mr. Boericke discussed "Trends in Metals for High-Temperature Service", outlining the development of superalloys during recent years in steam turbines, jet engine ram jets and missiles. He pointed out that increased strength of metal was gained through vacuum melting of the superalloys to prevent inclusions in the metals.

Mr. Hall continued the general theme of the program by describing "New Developments in Precipitation Hardening Alloys". Over the past ten years, the growth in tonnage of precipitation hardening alloys has been phenomenal. These alloys have found their place in high-speed aircraft where tensile strengths of 200,000 psi. are required. They are now available in local stocks because of their extensive use by the aircraft industry.

"Problems Connected With the Evaluation of High - Temperature Metals" was the third topic discussed. Reviewing the methods employed for high-temperature testing of aircraft parts during the last decade, Mr. Molander told of the problems involved in developing equipment for these test procedures.

History of the stages of advancement of the superalloys from pre-World War II to modern day was developed by Mr. Wilson in his discussion of the "Effect of Availability of Alloys on the Development of Materials for High-Temperature Service". National emergencies cause severe shortages of alloying elements such as nickel, vanadium, molybdenum and manganese. There is a need, Mr. Wilson said, to conserve these materials by substituting various other alloys.

Following a question and answer period, Chairman Roy E. Paine, Aluminum Co. of America, announced that Donald S. Clark, professor of mechanical engineering, California Institute of Technology, had been nominated for the A.S.M. national presidency for the coming year.—**Reported by E. Egloff for Los Angeles.**

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## "Thank-You" Letter From Science Award Principal

The following letter has been received at A.S.M. headquarters and is reprinted because it shows clearly how the A.S.M. Science Achievement Awards, conducted by the National Science Teachers Association through the Future Scientists of America program, are received within the schools on the secondary level.

"At a very nice assembly program on Tuesday (May 8) the awards received from the American Society for Metals were presented to six of our 'Future Scientists'. I think you would have been pleased with the cooperation here at school between the music department, the prefect of activities office, and the faculty in general, to make as perfect a setting as possible for the awarding of the certificates and the $100 bond.

"We are particularly indebted to Mr. Clark, the local chairman of the American Society for Metals in Philadelphia. I was only able to contact him late Monday afternoon to ask him for a representative from your group to be present the very next day. Within the hour he had succeeded in securing a promise from Mr. Harry Ghenn, metallurgist from American Viscose, to be present. Mr. Ghenn proved to be very gracious and capable, and everything went as smoothly as if it had been planned and practiced for months.

"Joy Luff, the recipient of the bond will, by means of it, be able to go to college this fall where she expects to major in chemistry. The tuition of the college she hopes to attend is $500 a year. Joy has a job for the summer and could plan on saving all but the last hundred. The bond makes the difference between her ability to go this year instead of having to postpone her education for a year as she thought she might have to do. She was a very happy little girl when she learned of her success in the contest.

"I feel that the support your organization is giving to these contests is one of the best promotional measures that could be adopted to make more people go into the science field. I know it has helped in this school."

Gratefully yours,
Sister Catherine Virginia S.N.D.
Notre Dame High School
Moylan—Rose Valley, Pa.

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## Hartford Holds National Officers Night Meeting

The **Hartford Chapter** recently held a dinner meeting honoring its past chairmen and national officers.

President A. O. Schaefer presented an account of his experience with large forgings. Particular reference was made to the methods of evaluation of defects using ultrasonic and coring methods. He presented some of his observations of German methods of testing and also some of the innovations in the melting and pouring practices used in that country.

Secretary W. H. Eisenman spoke on the new developments of the national organization, including the proposed building to house the offices, the Metals Engineering Institute and the proposed programs which would be conducted when the facilities are available.

A. H. D'Arcambal, Pratt & Whitney Co., and Frank Gilligan, Henry Souther Engineering Co., were honored as past national chairmen.—**Reported by G. W. Hunt for Hartford.**

# A.S.M. Review of Current Metal Literature

*An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month*

*Prepared by the Technical Information Division of Battelle Memorial Institute, Columbus, Ohio*

## A General Metallurgical

**186-A. You Can Reduce Noise in Your Foundry.** E. R. Lund and W. O. Hanson. *American Foundrymen's Society, Preprint No.* 56-144, 1956, 4 p.

Shows that the average foundryman can reduce the noise level in his shop effectively without a completely technical approach. Photographs. (A7, E general)

**187-A. Some Aspects of Dust Suppression in Foundries.** C. M. Stoch. *American Foundrymen's Society, Preprint No.* 56-178, 1956, 11 p.

Methods of dust suppression fall into two main groups, namely dust prevention and dust control. Summary of the research and development projects in the industrial health field. Diagrams, photographs, tables. 11 ref. (A7, A8, E general)

**188-A. William Park Woodside and His Philosophy of Research.** Alvin J. Herzig. *Metal Progress,* v. 69, May 1956, p. 69-72.

Positive information about a new metal and its rapid introduction into commercial products can best be achieved by two groups of men working together and supplementing each other—one, skilled workmen, the other, scientific researchers—who face squarely and even magnify any shortcomings of a new material or method. Photographs. (A9)

**189-A. New Russian Metallurgical Publications.** A. G. Guy. *Metal Progress,* v. 69, May 1956, p. 78-80.

New journals indicate that activity in metallurgical research and development has increased in the U.S.S.R., and its quality and quantity are approaching those of the free nations. (A general, U8)

**190-A. Atomic Information for Engineers and Industrialists.** Ernest E. Thum. *Metal Progress,* v. 69, May 1956, p. 91-94.

A historical note outlining the difficulties in differentiating between information to be held secret lest its publication should endanger "the common defense and security" and information necessary for an engineer and businessman to know to put the atom to work in peacetime industry. (A6, U8)

**191-A. A Dictionary of Metallurgy.** A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 23, Apr. 1956, p. 145-152.

From "Sharple's process" to "silver". (To be continued.) Diagrams, tables. (A10)

**192-A. The South African Uranium Industry.** C. S. McLean and T. K. Prentice. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 100-107.

Historical development, occurrence and distribution of uranium in ores, metallurgical practice. Table. (A4, B10, U)

**193-A. Fumes and Gases in Welding With Basic (Lime-Bearing) Electrodes. I. Physical Aspects. II. Physiological Considerations.** K. Kellermann and G. Lehmann. *British Welding Journal,* v. 3, May 1956, p. 196-200.

Experiments on white rats show that there is no reason to fear danger to health from the fumes developed in welding with basic covered (low-hydrogen type) electrodes. (A7, K1)

**194-A. Pretreatment of Metal-Finishing Wastes at Raleigh, North Carolina.** J. M. Roberts. *Sewage and Industrial Wastes,* v. 28, Apr. 1956, p. 513-516.

Source of waste, necessity of treatment, design requirements, pretreatment process and operating results. Table, diagram. (A8, L general)

**195-A. Recovering Lead and Tin From Wet Solder Drosses.** T. T. Campbell, F. E. Block and A. D. Fugate. *U. S. Bureau of Mines, Report of Investigations* 5210, Apr. 1956, 16 p.

Sampling, hydrometallurgy, control of pH, smelting and recovery of leach liquor. Diagrams, tables. 2 ref. (A8, C21, Pb, Sn)

**196-A.** (Portuguese.) **Expansion Plans in the Aluminum Industry.** Raimundo de Campos Machado. *ABM (Noticiario da Associacao Brasileira de Metais)* v. 10, no. 47, Feb. 1956, p. 4-5.

Review of progress and plans by the director of the Eletro Quimica Brasileira Co. (A4, Al)

**197-A.** (Portuguese.) **Recovering Zinc From Zinc-Iron Galvanizing Dross by the Process Employed at the Technological Research Institute.** Tharcisio D. de Souza Santos. *ABM (Boletim da Associacao Brasileira de Metais)* v. 12, no. 2, Jan. 1956, p. 15-23; disc., p. 23-26.

In hot dip galvanizing of iron and steel castings, a crust consisting of θ- or ξ-phase crystals forms on the bath of inferior lead. Recovering zinc from this crust is economically important. Sublimation in vacuum in chromium-nickel cast iron retorts gives 85 to 91% extra action in the form of ingots containing 0.14% lead, max. Photograph. 6 ref. (A8, L16, Fe, Zn)

*The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.*

**198-A. Vanadium in Steelmaking, Present and Future.** Hugo E. Johnson. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-JDS-136, Aug. 1948, 57 p.

A survey of technical personnel in the steel industry revealed the opinion that vanadium consumption would increase if the price were reduced and if research established definitely the real effect of vanadium as an alloying element in steel. Graphs, tables, map. (A4, B22, V, ST)

**199-A. New and Improved Metallurgical Techniques.** C. Sykes. *Institute of Metals, Journal,* v. 84, Apr. 1956, p. 287-290.

Developments of the past 20 years in analysis, metallographic techniques, structural examination and technology. Diagram, graph. 14 ref. (A general)

**200-A. Effect of Modernization on Efficiency.** Denis McQueen Potter. *Iron and Steel,* v. 29, May 1956, p. 183-187.

Case history of improvements in an English steelworks. (To be continued.) Photographs, table, diagram. (A5, D general, ST)

**201-A. A Dictionary of Metallurgy.** A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 23, May 1956, p. 185-192.

From "silver amalgam" to "solid solution". Graphs, diagrams, tables. (To be continued.) (A10)

**202-A. Secondary Metals—Nonferrous.** Archie J. McDermid. *U. S. Bureau of Mines Minerals Yearbook, Preprint,* 1953, 34 pages.

Data on recovery of metals from scrap; stocks, consumption and prices of scrap; production of secondary metal products. Graphs, tables. (A8, EG-a)

**203-A. Silver.** James E. Bell and Kathleen M. McBreen. *U. S. Bureau of Mines Minerals Yearbook, Preprint,* 1953, 20 pages.

Domestic production, consumption and uses in industry and the arts, monetary stocks, prices, foreign trade and world review. Tables, graphs. (A4, Ag)

**204-A.** (German.) **Production Planning and Operations Control in a Steel Foundry.** Erwin von der Horst. *Stahl und Eisen,* v. 76, no. 9, May 1956, p. 552-558.

Reasons for establishing a controlled organization; importance of cost evaluation and scheduling departments; statistical control of performance and cost. Charts. (A5, E general, CI)

**205-A.** (Book.) **Engineering Manual for Control of In-Plant Environment in Foundries.** 145 p. 1956. American Foundrymen's Society, Des Plaines, Ill.

General principles involved in foundry ventilation and hygiene problems; sources of air contaminants and methods of controlling them; ventilating systems.
(A7, E general)

**206-A.** (Book.) **Non-Ferrous Metals in Under-Developed Countries.** 129 p. 1956. United Nations Department of Economics & Social Affairs, New York, N. Y. $1.50.

Patterns of consumption, production and trade; international control schemes; mining, smelting and refining.
(A4, B general, C general, EG-a)

# B

## Raw Materials and Ore Preparation

**118-B. Influence of Temperature on Mechanical Strength of Coke.** John Varga, Jr., and H. W. Lownie, Jr. *American Foundrymen's Society, Preprint No.* 56-27, 1956, 4 p.

Investigation of bulk samples of coke, as used in the cupola, rather than individual pieces. Mechanical strength of coke at room temperature gives no indication of its mechanical strength at the higher temperatures encountered in cupola operation. Diagram, graphs, photographs. 10 ref. (B22, E10)

**119-B. Sintering Practice at Ford Motor Company.** Robert L. Cleveland. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 15-23; disc., p. 23-26.

Report on present sintering facilities, with special emphasis on the utilization of concentrates of high iron content produced from low-grade hematite deposits. Tables, diagram, photographs. (B16, A5, Fe)

**120-B. Permeability of Sinter-Plant Feed.** M. O. Holowaty and John F. Elliott. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 26-38; disc., p. 38-42.

A laboratory study of the influence of ore mixtures, method of mixing, moisture content and percentage of return fines on the permeability of several types of raw feed. Graphs, photographs, diagram, tables. 5 ref. (B16, Fe)

**121-B. Study of the Productivity of Conventional Dwight-Lloyd Sintering Machine.** M. O. Holowaty, H. A. Goldfein and C. B. Sheets. *Blast Furnace, Coke Oven and Raw Materials Committee for the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 43-75; disc., p. 75-81.

Production rate of sinter can be increased substantially by making proper changes in the equipment and the operational practices used at the conventional installation. Diagram, graphs, photographs, tables. 22 ref. (B16, Fe)

**122-B. Production and Properties of Experimental Pellet-Sinter.** F. M. Hamilton and H. F. Ameen. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 82-89; disc., p. 89-92.

The crux of the process lies in the preparation of a green pellet of the proper size and containing the proper amounts of fuel and moisture. Micrographs, graphs, tables, photographs. 2 ref. (B16, Fe)

**123-B. The Making of Self-Fluxing Sinter and Its Use in the Blast Furnace.** *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 134-149; disc., p. 149-154.

Sinter quality, plant productivity, process control, factors affecting coke consumption, gas distribution over furnace cross-section and blast furnace productivity. Photographs, tables, diagrams, graphs. 20 ref. (B16, D1, Fe)

**124-B. Lyometallurgical Tests on Marysvale Uranium Ores.** F. W. Bloecher, Jr. *Massachusetts Institute of Technology Mineral Engineering Laboratory (U. S. Atomic Energy Commission),* MITG-252, Nov. 1950, 28 p.

Uranium extractions range from 80 to 92% either by leaching raw ore with 10% nitrated ethyl ether or by leaching sulfuric acid-digested material with 5% nitrated ethyl ether. Graphs, tables. 8 ref. (B14, U)

**125-B. Recovery of Uranium From Its Ores.** G. Marvin, T. Upchurch, E. Greenleaf, E. Van Blarcom and A. Morphew. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 3-7.

Summary of recovery processes. Graphs. (B14, C general, U)

**126-B. Principles and New Developments in Uranium Leaching.** A. M. Gaudin. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 8-12.

Significant features of developments in uranium leaching in the post-war decade. Tables. (B14, U)

**127-B. Some Unusual Problems Met in the Recovery of Uranium From a Very Low-Grade Ore.** M. D. Hassialis and R. C. Musa. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations, p. 13-17.

Most critical factors are entrainment and solubility losses. Graphs, tables. 8 ref. (B14, U)

**128-B. Alkaline Leaching of Uranium Ores.** F. M. Stephens, Jr., and R. D. MacDonald. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 18-25.

Chemistry of carbonate leaching, factors affecting reaction rates, flowsheets. Diagrams, graph. 9 ref. (B14, U)

**129-B. The Carbonate Chemistry of Uranium: Theory and Applications.** L. A. McClaine, E. P. Bullwinkel and J. C. Huggins. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 26-37.

Review of theory. Carbonate leaching of ores, recovery of uranium from carbonate leach solution. Tables, graphs. 44 ref. (B14, U)

**130-B. Accelerated Thickening and Filtering of Uranium Leach Pulps.** Joe B. Rosenbaum and J. Bruce Clemmer. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 38-44.

Research to find better additives for improving thickening and filtration of uranium leach pulps and other plant products. Tables. 3 ref. (B14, U)

**131-B. Canadian Practice in Ore Dressing and Extractive Metallurgy of Uranium.** A. Thunaes. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 81-84.

Uranium and associated mineral in the more important ores; effect of these on ore treatment. Leaching and pre-concentration methods. 9 ref. (B14, U)

**132-B. Recovery of Uranium From Uranium Bearing Alum Shale.** Erik Svenke. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 90-93.

Development of industrial shale treatment methods in Sweden. Photographs, diagrams, graph, table. (B14, U)

**133-B. Beneficiation Characteristics of Uraniferous Ores in India.** R. Krishnaswamy, J. Y. Somnay and G. V. Rao. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 136-139.

Because of the complexity of uranium minerals occurring in the ores and because of the extreme fineness of grind required for their liberation, direct methods of concentration have been of little use. Photograph, tables, autoradiograph. (B14, U)

**134-B.** (Russian.) **Pretreatment of Raw Materials for Smelting at the Magnitogorsk Metallurgical Combine.** A. P. Iakobson. *Metallurgy,* no. 1, Jan. 1956, p. 3-6.

Some pretreatment features essential to good smelting: blending of ores prior to concentration; maintenance of the desired chemical composition of the agglomerate mix; thorough crushing of flux, ore and fuel. Tables. (B general)

**135-B.** (Russian.) **Production of Fluxed Agglomerate at the Makeevka Metallurgic Plant.** B. G. Kumani and M. Sh. Barylo. *Metallurg,* no. 2, Feb. 1956, p. 3-5.

Advantages of adding quicklime to limestone used as flux in sintering agglomerate. Diagram, tables. (B16, Fe)

**136-B. Uranium Oxide From Ores.** Arthur Linz. *Chemical Engineering Progress,* v. 52, May 1956, p. 205-209.

Six process flowsheets. Tables, map. (B14, U)

**137-B. Raw Materials Conference on Solvent Extraction.** Arthur M. Ross. *National Lead Company, Inc.*

*Raw Materials Development Laboratory (U. S. Atomic Energy Commission)*, TID-7508, Apr. 1955, 72 p.

Seven papers concerning the application of solvent extraction to raw materials processing. Photograph, tables, graphs, diagrams. (B14)

**138-B. Preliminary Pilot Plant Testing of Resin-in-Pulp Ion Exchange of Alkaline Leach Pulps.** C. K. McArthur, T. F. Izzo, R. G. Beverly, A. W. Griffith and R. L. Shimmin. *National Lead Company Inc., Raw Materials Development Laboratory (U. S. Atomic Energy Commission)*, WIN-11, Apr. 1955, 21 p.

Tests to determine the possibility of recovering uranium from alkaline leach pulps; a tentative pilot plant flowsheet. Tables, diagram. (B14, U)

**139-B. New Methods of Testing Blast-Furnace Sinter for Its Mechanical Properties.** N. Z. Plotkin, G. G. Oreshkin and A. K. Rudkov. *Henry Brutcher Translation No.* 3645, 10 p. (From *Stal*, v. 15, no. 10, 1955, p. 887-891.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 13-B, 1956. (B16, Q general, Fe)

**140-B.** (German.) **Reactions Between Molten Iron Phosphorus Slag.** Oskar Peter, Wilhelm von dem Esche and Willy Oelsen. *Archiv für das Eisenhüttenwesen*, v. 27, no. 4, Apr. 1956, p. 219-230.

Possibilities of smelting phosphorus slags of different iron content by use of phosphoric acid dolomite. The slags are saturated with calcium and magnesium oxide crystals. The phosphorus content seems to be independent of the iron content. Tables, graphs, photograph, micrographs, phase diagram. 16 ref. (B21, Fe)

**141-B.** (Swedish.) **Grinding Investigations at Malmberget.** Bengt Fagerberg and Lennart Wellenius. *Jernkontorets Annaler*, v. 140, no. 3, 1956, p. 189-223.

Data on a Swedish plant for the production of high-grade magnetite concentrates which will be pelletized. Mill feed will consist of 15 mm. magnetite ore and middlings from a dry magnetic separation plant. Tables, graphs, diagram, photograph. 36 ref. (B13, Fe)

**142-B. Development of the Inco Iron Ore Recovery Process.** *Canadian Mining and Metallurgical Bulletin*, v. 49, no. 529, May 1956, p. 337-343.

Production of ferrous by-product from nickel ores. Pilot plant studies of roasting, leaching, and agglomerating procedures. Tables, diagrams. 17 ref. (B14, B15, B16, Fe)

**143-B. Uranium Extractants—Preparation and Use in Phosphate System.** H. Heidt, D. E. Tynan, R. F. McCullough and R. Bart. *International Minerals and Chemical Corporation (U. S. Atomic Energy Commission)*, RMO-2030, Sept. 1954, 121 pages.

Data on research accomplishments on the preparation of organic phosphate esters for the extraction of uranium from monocalcium phosphate, phosphoric acid and other acidic phosphate solutions using liquid-liquid extraction techniques. Tables, graphs. (B14, U)

**144-B. Uranium Recovery—Wet Process Liquors From Phosphate Rock.** Henry M. Heidt, Donald E. Tynan, J. B. Adams and Roger Bart. *International Minerals and Chemical Corporation (U. S. Atomic Energy Commission)*, RMO-2042, Feb. 1955, 124 p.

Summary of laboratory research and pilot plant development programs on the extraction and recovery of uranium from monocalcium phosphate extract and wet process phosphoric acid. Diagrams, graphs, tables. (B14, U)

**145-B. Recovery of Uranium as a Single Product From the Florida Leached Zone.** C. F. Coleman. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1500, Mar. 1953, 131 p.

A wide variety of ore samples were studied for extraction of uranium and for recovery of uranium from the resulting pregnant liquor. Diagram, graphs, tables. 14 ref. (B14, U)

**146-B.** (French.) **Notes on Industrial Research in the Field of Ore Reduction. Application to the Production of 75% Ferrosilicon.** A. Palazzi and F. Rinaldi. *Revue de Métallurgie*, v. 53, no. 2, Feb. 1956, p. 92-104.

Research carried out in an electric low-shaft furnace, producing 75% ferrosilicon. Tables, graphs, histograms. 7 ref. (B22, Fe-n)

**147-B.** (French.) **Sulfur in Silicate and Aluminate Slags.** F. D. Richardson and C. J. B. Fincham. *Revue de Métallurgie*, v. 53, no. 3, Mar. 1956, p. 215-230; disc., p. 231-232.

Study of the partition of sulfur between gases containing sulfur and oxygen under controlled partial pressure, and slags used in iron and steelmaking. Graphs, tables. 31 ref. (B21, D general, Fe, ST)

**148-B.** (Polish.) **Ionic Theory of Slags.** Andrzej Staronka. *Hutnik*, v. 23, no. 3, Mar. 1956, p. 110-117.

Fundamentals of the problem, method of determination of slag activity on basis of the theory of ideal solutions. Graphs, diagrams. 32 ref. (B21)

# C

## Nonferrous Extraction and Refining

**180-C. The Melting of High Purity Uranium.** B. Blumenthal. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5019, Nov. 1952, 56 p.

A melting process developed for the consolidation of high-purity electrolytic uranium crystals into sound ingots of high density without serious contamination. Tables, graphs, diagrams, photographs, micrographs. 19 ref. (C5, U)

**181-C. The Separation of Zirconium and Hafnium.** James F. Shea, D. W. Scott, H. W. Adam, A. E. Austin and C. M. Schwartz. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-JDS-202, June 1949, 36 p.

Petrographic, X-ray and analytical studies were made on synthetic and natural zirconium minerals to determine how hafnium occurs in zirconium ores, to evaluate the possibility of separating it by physical means, and to devise some simple method for classifying the hafnium content of zirconium ores. Tables. (C general, B14, Hf, Zr)

**182-C. Production of Zirconium at Y-12.** J. W. Ramsey and W. K. Whitson, Jr. *Carbide and Carbon Chemicals Company (U. S. Atomic Energy Commission)*, Y-817, Oct. 1951, 41 p.

General description of zirconium plant includes materials of construction, principal equipment, construction drawings, operating conditions and costs information. Tables, photographs, diagrams. (C general, A5, Zr)

**183-C. Preparation of Pure Nickel by Electrolysis of a Chloride Solution.** W. A. Wesley. *Electrochemical Society, Journal*, v. 103, May 1956, p. 296-300.

Pure nickel was prepared in the form of malleable electrodeposited sheets as thick as 6 mm. from purified nickel chloride-boric acid solution using iridium-platinum alloy anodes. Tables. 10 ref. (C23, Ni)

**184-C. Electrochemical Characteristics of Melts in the Sb-$Sb_2S_3$ System.** Tsutomu Yanagase and Gerhard Derge. *Electrochemical Society, Journal*, v. 103, May 1956, p. 303-306.

Liquid antimony and antimony trisulfide were equilibrated at various temperatures and electrolyzed with the metal phase as anode and the sulfide phase as cathode. Current efficiencies varied below 60% and analysis of the data indicated that the balance of the current should be accounted for by the electronic character of the melt rather than losses or side reactions. Diagram, graphs, tables. 4 ref. (C23, Sb)

**185-C. The Resin-in-Pulp Process for Recovery of Uranium.** R. F. Hollis and C. K. McArthur. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 54-63.

Chemistry, variables and development of process; operation of the pilot plant rip circuit; commercial design considerations. Diagrams, tables, graphs. (C general, B14, U)

**186-C. An Ion Exchange Process for the Recovery of Uranium From Carbonate Leach Solutions.** Jagdish Shankar, D. V. Bhatnagar and T. K. S. Murthy. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 64-70.

Effluent from the process can be recycled for contacting fresh ore. In the adsorption stage, uranium is freed from impurities. Sodium nitrate used for elution serves as a salting-out agent in solvent extraction process and the raffinate, after adjusting the composition, can be used for a second elution. Tables, graphs, diagram. 5 ref. (C general, U)

**187-C. Recovery of Uranium From Phosphates by Solvent Extraction.** Ray S. Long, David A. Ellis and Richard H. Bailes. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 77-80.

Processes for recovery from phosphoric acid and from normal superphosphate. Diagram, graph. (C general, U)

**188-C. The Extraction of Thorium and Uranium From Monazite.** P. Krumholz and F. Gottdenker. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 126-128.

A new process for the separation of thorium and uranium and for the production of technically pure thor-

ium compounds from crude thorium hydroxide as obtained in the alkaline decomposition of bonazite. 10 ref. (C28, Th, U)

**189-C. Uranium Metallurgy in Belgium.** Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 156-161.

Description of processes to be used in new facility for the industrial production of natural uranium. (C general, U)

**190-C. The Preparation of Uranium Metal by the Reduction of Uranium Tetrafluoride With Magnesium.** H. A. Wilhelm. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 162-174.

Experiments, studies and observations made in connection with the development and operation of a large-scale low-cost process for the production of high-purity uranium metal. Graphs, photographs, diagrams. (C26, U)

**191-C. Fundamental Considerations in the Reduction Processes of Thorium and Uranium.** B. Kopelman. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 175-183.

Various methods useful for the production of thorium and uranium metal examined from the standpoint of ease of reduction, cost and purity of the product, as well as the type of product to be produced. Graphs, micrographs, tables. 9 ref. (C general, Th, U)

**192-C. Zirconium Metal Production.** S. M. Shelton, E. D. Dilling and J. H. McClain. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 505-550.

Ores, production methods, properties and uses; details of the production of reactor-grade zirconium by the Bureau of Mines. Diagrams, photographs, graphs, tables. 66 ref. (C general, Hf, Zr)

**193-C. Process for Separation of Zirconium and Hafnium.** J. Hure and R. Saint-James. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 551-553.

Countercurrent extraction using tributyl phosphate as a solvent. Graphs, diagram. 3 ref. (C general, Zr, Hf)

**194-C. Separation of Hafnium From Zirconium by Vapour Phase Dechlorination.** Brahm Prakash and C. V. Sundaram. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 554-558.

Process consists of production of anhydrous zirconium chloride from zircon, purification of the chloride to free it from contaminants other than hafnium and vapor phase dechlorination for hafnium removal. Diagrams, table. 20 ref. (C4, Zr, Hf)

**195-C. Separation of Hafnium From Zirconium and Production of Pure Zirconium Dioxide.** N. P. Sajin and E. A. Pepelyaeva. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 559.

Separation was accomplished through fractional crystallization of potassium fluozirconate. Table, photographs, graphs. 9 ref. (C28, Hf, Zr)

**196-C. Methods of Separating Zirconium From Hafnium and Their Technological Implications.** F. Hudswell and J. M. Hutcheon. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 563-571.

Some processes studied in Great Britain, their relation to the general background of the extractive metallurgy of zirconium and their technological significance. Table, graphs, photograph, diagrams. 13 ref. (C general, Zr, Hf)

**197-C.** (French.) **Extraction of Metallic Gallium From Hungarian Bauxite.** E. Papp, A. Héjja and J. Oveges. *Acta Technica Academiae Scientiarium Hungaricae,* v. 14, nos. 1-2, 1956, p. 55-78.

Available data show that metallic gallium cannot be extracted economically if no changes are made in the conventional process, but probably the process of precipitation of alumina hydrate by the carbon dioxide method will be suitable for the production of plain metallic gallium. Tables, diagrams, photograph. 44 ref. (C general, Ga, Al)

**198-C. Separation of the Lanthanons at Amalgam Cathodes. II. The Separation of Samarium From Gadolinium and Purifications of Europium at a Lithium Amalgam Cathode.** E. I. Onstott. *American Chemical Society, Journal,* v. 78, May 20, 1956, p. 2070-2076.

The amalgam cathode separation of the lanthanons appears to offer unusual promise for rapid enrichment of specific lanthanons. Separation can be accomplished in solutions of citrate complexes or in acid solutions. Graphs, tables. 14 ref. (C28, Sm, Gd, Eu)

**199-C. Precipitation of Metal From Salt Solution by Reduction With Hydrogen.** F. A. Schaufelberger. *Mining Engineering,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 8, May 1956, p. 539-548.

Review of pertinent literature, mechanisms of metal precipitation, nucleation, growth and agglomeration, solubility phenomena of gases and solids at elevated temperatures. Micrographs, tables, graphs. 34 ref. (C2, Cu, Ni, Co, Cd)

**200-C. Production of Boron by Igneous Electrolysis.** J. L. Andieux and W. J. Deiss. *Henry Brutcher Translation No.* 3659, 8 p. (Abridged from *Bulletin de la Société Chimique de France,* no. 6, June 1955, p. 838-841.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 116-C, 1955. (C23, B)

**201-C. Influence of Low-Frequency Vibrations of the Mold Upon Ingot Crystallization.** V. I. Leont'ev. *Henry Brutcher Translation No.* 3716, 7 p. (From "Problems of Metallography and Metal Physics" 4th Collection of Papers. State Scientific and Technical Publishing House for Ferrous and NF Literature under Ministry for Ferrous Metallurgy, Moscow, 1955, p. 70-76.) Henry Brutcher, Altadena, Calif.

Investigation of influence of vibration velocity and acceleration of ingot mold upon structure of ingot. Beneficiation of ingots by jolting. Photographs. 4 ref. (C5, D9, N12, Zn, ST)

**202-C.** (Hungarian.) **Casting Problems With Aluminum-Copper-Magnesium Alloy.** Lajos Almashegi. *Kohaszati Lapok,* v. 11, no. 3, Mar. 1956, p. 129-131.

The cracking of cast ingots, its causes and prevention, based on industrial experience. Graphs, diagram. (C5, Al, Cu, Mg)

**203-C.** (Portuguese.) **Effect of Agitation on the Speed of Elimination of the Zinc Dissolved in Lead, by Reaction With PbO.** Tharcisio D. de Souza Santos. *ABM(Boletim da Associacao Brasileira de Metais.* v. 12, no. 2, Jan. 1956, p. 27-40; disc., p. 40-41.

Dezincification process, developed in 1942, is based on oxidation by PbO and direct oxidation by an air blast. Effect on reaction kinetics by mechanical agitators. Graphs, diagrams. 3 ref. (C28, Zn, Pb)

**204-C.** (Portuguese.) **Practical Process Control of the Dezincification of Lead by Means of "Solidification Tests".** Tharcisio D. de Souza Santos. *ABM(Boletim da Associacao Brasileira de Metais,* v. 12, no. 2, Jan. 1956, p. 43-52; disc., p. 53.

The dezincing operation, which comes after desilvering, may be followed at every stage by checking on shape and size of crystals and the presence of films on the surface of a specimen obtained by slow cooling of the liquid bath. Micrograph, photographs, graph. 5 ref. (C28, Zn, Pb)

**205-C.** (Portuguese.) **Dezincification of Desilvered Lead by the Process Employed at the Technological Research Institute.** Tharcisio D. de Souza Santos. *ABM(Boletim da Associacao Brasileira de Metais,* v. 12, no. 2, Jan. 1956, p. 55-62; disc., p. 63-64.

Eliminating the zinc by reactions with lead oxide and the oxygen of an air blast in cast iron ladles, at 640 to 660° C. Extreme purity of lead after about 4 hr. of this treatment. Economy and high yield. Table. 9 ref. (C28, Zn, Pb)

**206-C. The Electrolytic Zinc Plant of the Hudson Bay Mining & Smelting Company, Limited.** E. Austin and W. E. McFadden. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 529, May 1956, p. 344-359.

Roasting, leaching, electrolysis and casting facilities. Photographs, diagrams, tables. (C23, C5, B14, B15, Zn)

**207-C. Pyrochemical Separation Methods: I. The Distribution of Plutonium and Long-Lived Fission Products Between Molten Irradiated Uranium Fuel and Fused Inorganic Fluorides.** Archie G. Buyers. *North American Aviation, Inc. (U. S. Atomic Energy Commission),* NAA-SR-1157, Mar. 1955, 32 p.

Data from equilibration at 1300° C. with various salt scrubs have established the effectiveness of plutonium extraction by uranium tetrafluoride. Photographs, tables, graphs. 9 ref. (C4, U, Pu)

**208-C.** (French.) **The Development of Metallurgy at Katanga.** Charles Piedboeuf. *Revue Universelle des Mines,* v. 12, no. 9, May 1956, p. 133-144.

Development of extractive nonferrous metallurgy at the Katanga Steelworks. Production of copper and cobalt by electrolysis and zinc and uranium by hydrometallurgical processes. Diagrams, graph. (C general, Co, Cu, Zn, U)

**209-C.** (French.) **Contribution to the Study of the Composition of Copper Mattes.** Jean-Jacques Comhaire. *Revue Universelle des Mines,* v. 12, no. 9, May, 1956, p. 145-153.

Chemical analysis, microscopy and radio-crystallography indicate the presence of galena which enters into the formation of a eutectic, whose second element is formed by the association of copper sulfide and bornite. After liquidation, the presence of carrollite and seligmannite is also indicated. Tables, diagrams, micrographs, radiogram. 20 ref. (C21, Cu)

**210-C.** (Russian.) **Effects of Amperage and Current Density on Yield From Cryolite-Alumina Electrolytic Baths.** L. N. Antipin and I. Niderkorn. *Zhurnal Prikladnoi Khimii,* v. 29, no. 4, Apr. 1956, p. 577-583.

Hall process in production of aluminum. Yield versus current and current density curves reveal maximums and minimums explained by the release of sodium. Graphs, table, diagram. 8 ref. (C23, Al)

**211-C.** (Book.) **Proceedings of the International Conference on the Peaceful Uses of Atomic Energy, v. VIII. Production Technology of the Materials Used for Nuclear Energy.** 627 p. 1956. United Nations, New York. $10.00.

Details of chemical and metallurgical processes for such materials as uranium, thorium, beryllium, zirconium and heavy water. Pertinent papers separately abstracted. (C general, Th, U, Zr, Be)

# D

## Ferrous Reduction and Refining

**194-D. Production and Use of Iron Coke.** Charles C. Russell, P. Whitstone and R. P. Liggett. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 93-119; disc., p. 119-122.

Development of process for combining iron oxides and coal for coking, production problems, results obtained from use in blast furnace. Photographs, micrograph, tables, graphs. 17 ref. (D1, B16, B18, Fe)

**195-D. Use of Open Hearth Slag in Blast Furnaces, and Effect on Open Hearth Practices.** E. B. Speer. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 181-185; disc., p. 186-202.

Process for producing a more economical basic hot metal, which is as consistent in chemical analysis and physical temperature as that produced by the conventional blast furnace burden with little or no openhearth slag. Table, graphs. (D1, D2, Fe)

**196-D. A Report on Solid Movement in Blast Furnace Models.** J. B. Wagstaff. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 298-320; disc., p. 320-325.

Movement of the stock column was investigated using a thin slice model and a semicircular one. Graph, diagram, photographs. 11 ref. (D1, Fe)

**197-D. Rate of Reduction of Iron Oxide From a Blast-Furnace Type Slag by Liquid Iron in Carbon Crucibles.** W. O. Philbrook and L. D. Kirkbride. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 326-335; disc., p. 335-338.

Reaction rates measured for a reduction of iron oxide from a lime-silica-alumina slag over carbon-saturated iron in graphite crucibles. Tables, graphs. 9 ref. (D1, P12, Fe)

**198-D. Rate of Sulphur Transfer Between Blast-Furnace Type Metal and Slag.** S. Ramachandran, T. B. King and N. J. Grant. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 338-349.

Previous laboratory work; an apparatus which combines conventional sampling techniques with automatic measurement of carbon monoxide evolution as a measure of the rate of desulfurization; some preliminary results. Diagrams, tables, graphs. 13 ref. (D1, Fe)

**199-D. Rate of Desulphurization of Iron by Blast-Furnace Type Slags.** W. O. Philbrook and G. Derge. *Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 14, 1955, p. 350-362, disc., p. 362-363.

Kinetics and mechanism of desulfurization. Graphs. 10 ref. (D1, Fe)

**200-D. Versatile Melting Equipment for Alloy Development.** L. M. Bianchi and A. J. Schulte. *Metal Progress,* v. 69, May 1956, p. 73-76.

Can produce heats ranging from laboratory size for preliminary investigation to production sizes for full-scale testing. Photograph. (D general, E10)

**201-D.** (German.) **Noise Measurement for Control of Blow in Purifying Process.** H. J. Klärding and F. R. Licht. *Metall,* v. 10, Nov. 9-10, May 1956, p. 405-415.

Origin of noises in a converter, effect of converter mouth on the noise intensity, expression of blow conditions in a noise graph, relation between decarbonization and the ratio of noise intensity. Interpretation of metallurgical processes from a noise graph. Table, graphs. 9 ref. (D3, ST)

**202-D.** (German.) **On the Development of the Vertical Continuous Casting Process for Steel.** Karl Georg Speith and Adolf Bungeroth. *Stahl und Eisen,* v. 76, no. 8, Apr. 19, 1956, p. 437-442.

Fundamental conditions encountered in the casting of steel. Continuous casting from holding furnaces and from ladles. Continuous casting with increased receiving capacities of the mold. Simultaneous casting of more than one bar. Prevention of accidents. Diagrams, graphs. 16 ref. (D9, ST)

**203-D.** (Japanese.) **On Oxidation Degree, Reduction Degree and Reducibility of Iron Ore.** Shigeichi Sasaki and Haruo Adachi. *Iron and Steel Institute of Japan, Journal,* v. 41, no. 4, Apr. 1956, p. 399-407.

Methods for indicating degree of oxidation and reduction, tests involving the factors influencing reducibility. Tables, graphs. 11 ref. (D general, Fe)

**204-D.** (Russian.) **Use of Water-Cooled Metal Chills for Flux Melting in Electric Furnaces.** B. E. Paton, O. S. Zabarilo and V. G. Ubel'. *Avtomaticheskaia, Svarka,* v. 9, no. 1, Jan.-Feb. 1956, p. 65-69.

Use of water-cooled metal chills saves furnace lining from extra wear and protects the melted flux from contamination with the products of disintegration of the lining. The influence of the lining on chemical composition of the flux is also reduced. Diagrams, tables. (D5, ST)

**205-D.** (Russian.) **Oxygen in Steel Poured From the Bottom.** V. A. Mchedlishvili and A. M. Samarin. *Izvestiia Akademii Nauk SSSR- Otdelenie Tekhnicheskikh Nauk,* no. 3, Mar. 1956, p. 106-110.

The lowering of oxygen content in steel due to the flotation of nonmetallic impurities in the process of bottom pouring. Photographs, table. 7 ref. (D9, ST)

**206-D.** (Russian.) **Use of Oxygen for Raising the Efficiency of Openhearth Furnaces.** A. V. Leskov. *Metallurg,* no. 1, Jan. 1956, p. 7-9.

Problems of using oxygen for quick smelting in openhearth furnaces. Economies of the method. Diagrams, graph. (D2, ST)

**207-D.** (Russian.) **Smelting of Stainless Steel in Oxygen Blast.** N. I. Shutkin. *Metallurg,* no. 1, Jan. 1956, p. 10-11.

Advantages of using oxygen blast in smelting stainless steel: fuller utilization of scrap, lower carbon content in the product, higher efficiency of the electric furnaces due to shorter smelting periods. Diagram, table, graph. (D5, SS)

**208-D.** (Russian.) **Development of the Continuous Steel Casting Process.** M. S. Boichenko, V. S. Rutes and V. V. Ful'makht. *Metallurg,* no. 2, Feb. 1956, p. 7-11 + 1 color plate.

Comparative research study of various aspects of continuous casting; advantages of vertical casting on subsurface level; experimental installations at two metallurgical plants employing a sprayer-type secondary cooling system; references to metallurgical practices abroad. Diagrams, photographs. (D9, ST)

**209-D.** (Russian.) **Raising the Economic and Productive Efficiency of Openhearth Furnaces by Installation of Waste-Heat Boilers and Evaporation Cooling Systems.** I. I. Bruk. *Metallurg,* no. 2, Feb. 1956, p. 17-22.

Heat-saving characteristics of waste-heat boilers and of evaporation-cooling systems in openhearth furnaces. A complex installation for simultaneous utilization of heat from flue gases and from furnace elements subjected to cooling. Diagrams, table. (D2, ST)

**210-D.** (Russian.) **Industrial Experience With Manufacturing E320 Transformer Steel.** G. M. Borodulin, G. F. Morenko and V. P. Frantsov. *Metallurg,* no. 3, Mar. 1956, p. 14-16.

A technological process of refining transformer steel in basic electric-arc furnaces; peculiarities of the method. Table. (D5, ST)

**211-D.** (Russian.) **Improvement in Smelting of Bessemer Cast Iron.** V. D. Kichko. *Metallurg,* no. 3, Mar. 1956, p. 25-28.

Influence of the gas permeability of the charge on operation of the blast furnace; methods of controlling flow of gases in the furnace. Diagram, graphs. (D1, D3, CI)

**212-D.** (Russian.) **Experimental Speed Melting of Steel From Phosphorus Cast Irons.** F. F. Sviridenko, B. A. Sharov and L. G. Fetisov. *Metallurg,* no. 3, Mar. 1956, p. 28-32.

Advantages of refining phosphorus cast iron under intensified thermal conditions. Table. (D general, ST)

**213-D.** (Russian.) **Bottom Repair in High-Capacity Openhearth Furnaces.** M. M. Privalov. *Metallurg,* no. 2, Feb. 1956, p. 30-33.

Procedures in repair work on bottoms of furnaces; maintenance requirements reducing wear on bottoms and tap holes. Diagrams, table. (D2)

**214-D.** (Russian.) **Operation of Blast Furnaces Under a Modified System of Shaft and Bosh Cooling.** G. G. Oreshkin. *Metallurg,* no. 3, Mar. 1956, p. 1-7.

Data on performance of two experimental blast furnaces with plate cast iron coolers, one with standard dimensional specifications, the other with profile modifications taking account of the stabilized dimensional changes in the former after a number of years of operation. Advantages and details of the modification and its bearing on cooling requirements. Diagrams, tables, graph. (D1, Fe)

**215-D.** (Russian.) **Use of Oxygen in the Converter.** S. G. Afanas'ev. *Metallurg,* no. 3, Mar. 1956, p. 8-13.

Method of accelerating the converter process with oxygen blast. Design of the converter, technology of refining, mechanical properties of the steel. Diagrams, graph, photograph, tables. (D3, Q general, ST)

**216-D.** (Russian.) **Rate of Interaction Between Solid Components of Blast Furnace Slag.** B. A. Shilt, A. P. Liuban and V. G. Manchinskii. *Stal,* v. 16, no. 4, Apr. 1956, p. 303-307.

Experimental data on the formation of solid silicates and aluminosilicates of calcium and manganese prior to formation of liquid slag in the blast furnace. Suggests a theory of diffusion nature of the interaction process between solid components of the slag. Graphs, diagram. 7 ref. (D1, B21, Fe)

**217-D.** (Russian.) **Study of Metallic Properties of Continuous Castings.** N. L. Komandin. *Stal,* v. 16, no. 4, Apr. 1956, p. 307-316.

Number of aspects of continuous castings, crystallization conditions, macrostructure, mechanical properties; nonmetallic impurities, surface of the casting, fissure formation, technological processing. Graphs, photographs, tables, micrographs. (D9, N12, ST)

**218-D.** (Russian.) **Behavior of Oxygen and Nitrogen in the Bath of the Electric Arc Furnace During Oxidation With Oxygen and With Ore.** S. M. Gnuchev, G. K. Komissarov and Z. V. Klochkova. *Stal,* v. 16, no. 4, Apr. 1956, p. 323-327.

Behavior does not depend on whether the metal is oxidized with oxygen or with ore. In the case of oxygen, however, the upper limits of concentration of oxygen and nitrogen in the metal are reached in a shorter time and with less consumption of electric power. Tables, graphs. 2 ref. (D5, ST)

**219-D.** (Spanish.) **Experiments on the Casting and Preparation of the Ingot Obtained by the Continuous Cold Ingot-Mold System.** Franz Leitner. *Instituto del Hierro y del Acero,* v. 9, no. 44, Mar. 1956, p. 258-266.

Continuous casting equipment at Breitenfeld steel plant. Details of installation and successful operation. Diagram, photographs, micrographs, graph, table. (D9, ST)

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**220-D. The Refining of Stahleisen by the Oxy-Steam Process.** H. Kosmider and A. Weyel. *Blast Furnace and Steel Plant,* v. 44, May, 1956, p. 483-492, 502.

Full-scale converter experiments involving the blowing of stahleisen with oxygen and steam. Comparison of bottom-blown and surface injection converters to illustrate differences in the practical application and economics of the two methods. Improvement of the heat balance by after-burning of converter waste gases. Graphs, tables. 9 ref. (D8, ST)

**221-D. Performance of Carbon Blocks in Hearth Walls and Bottom of Blast Furnace.** I. G. Polovchenko. *Henry Brutcher Translation No.* 3646, 11 p. (Abridged from *Stal,* v. 15, no. 10, 1955, p. 891-894.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 31-D, 1956. (D1, B19, Fe)

**222-D. Kinetics of Reduction of Iron Oxides by Gaseous Reductants at Low Temperatures.** A. G. Moskicheva and G. I. Chufarov. *Henry Brutcher Translation No.* 3704, 6 p. (From *Doklady Akademii Nauk SSSR,* v. 105, no. 3, 1955, p. 510-513.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 87-D, 1956. (D general, Fe)

**223-D. The Demag-Humboldt Low-Shaft Furnace Process.** H. Reinfeld. *Henry Brutcher Translation No.* 3710. (Part from *Radex Rundschau,* no. 6, 1955, p. 532-543.) Henry Brutcher, Altadena, Calif.

Production of higher grade pig iron in a modified furnace. Operational and technical details. Tables, graphs, diagrams, micrographs. 13 ref. (D1, Fe)

**224-D.** (Czech.) **Energetic and Economic Balance of the (LD) Oxygen Process.** Alexander Dekanovsky. *Hutnické Listy,* v. 11, no. 4, Apr. 1956, p. 241-248.

Attempts to make a thermo-energetic balance of the oxygen process and to compare it with the basic bessemer process. Tables, graphs. 6 ref. (D8, D3, ST)

**225-D.** (French.) **Statistical Study of Consumption in the Casting and Rolling of Steel.** M. Spreux. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 13, no. 4, 1956, p. 735-743.

Statistical study to obtain average consumption figures for each operation in the casting of steel and the rolling of an ingot. Graphs. (D9, F23, S12, ST)

**226-D.** (Italian.) **Induction Stirring. Application to Desulfurization.** J. Duflot and M. Porcheray. *Metallurgia Italiana,* v. 48, no. 3, Mar. 1956, p. 101-110.

Equipment, operation and results when applied during desulphurization. Tables, graphs. 3 ref. (D5, ST)

**227-D.** (Japanese.) **Recent Development of Electric Arc Furnaces for Steel Melting.** Tatsuo Hayashi. *Iron & Steel Institute of Japan, Journal,* v. 41, no. 5, May 1955, p. 536-550.

Developments in operation and construction of electric-arc furnaces in United States and Japan; production of electrodes and refractories; operation methods, especially oxygen smelting and induction stirring; economic problems of electric furnaces based on expenses incurred for various production units. Graphs, tables. 75 ref. (D5, ST)

**228-D. The Fluxing of Iron Ore Gangue by Dolomitic Limestone.** P. D. S. St. Pierre. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 529, May 1956, p. 360-367; *Canadian Institute of Mining and Metallurgy, Transactions,* v. 59, 1956, p. 224-231.

Melting relationships of blast furnace slag compositions. Tables, diagrams, graphs. 3 ref. (D1, B21, Fe)

**229-D. Faster Open Hearth Charging. Improving Scrap and Supply Services.** M. D. J. Brisby. *Iron and Steel,* v. 29, May 1956, p. 163-165.

Charging times, scrap quality and pan weights, effect of bad scrap and scrap preparation. Tables, graphs. 2 ref. (D2, ST)

**230-D. Studies on a 10-Cwt. Arc Furnace.** W. H. Glaisher, M. Preston and J. Ravenscroft. *Iron and Steel Institute, Journal,* v. 183, May 1956, p. 22-41.

The study was chiefly on electricity and electrode consumption and on roof wear, and was concerned principally with the melting phase of the process, although some of the conclusions obtained also apply to the refining stage. Tables, diagrams, graphs. 5 ref. (D5, ST)

**231-D. Some Factors Affecting Electrode Consumption in the Electric Arc Furnace.** D. H. Houseman. *Iron and Steel Institute, Journal,* v. 183, May 1956, p. 48-53.

The direct potential-drop method was used to study the relationship between electrode consumption and resistivity. Tables, graphs, diagram. 9 ref. (D5)

**232-D. Instrumentation in Steelworks. I. The Open-Hearth Steelworks. II. The Basic Bessemer Steelworks.** G. Husson and P. J. Leroy. *Iron and Steel Institute, Journal,* v. 183, May, 1956, p. 54-63.

Use of immersion pyrometers, pressure gauges, flow meters, total-radiation pyrometers, photoelectric cells and suction pyrometers in open-hearth steelworks; advantages in a basic bessemer steelworks of volumetric recording flow meters, two-color pyrometers, flame pyrometers and opacimeters. Graphs, diagrams, photographs. 13 ref. (D2, D3, S16, S18, ST)

**233-D.** (French.) **The Hot-Blast Cupola in an Openhearth Steel Plant.** S. Tunder. *Métallurgie,* v. 88, no. 4, Apr. 1956, p. 367-368, 371.

Use of cupola for melting scrap iron and producing liquid cast iron charged in the openhearth. Photographs. (D2, E10, CI)

**234-D.** (French.) **A Systematic Study of Desulfurization Processes.** Borut Marincek. *Revue de Métallurgie,* v. 53, no. 1, Jan. 1956, p. 67-75.

Desulfurization processes are improved by increasing stability of the formed sulfides and activity of sulfur in the melt, and by lowering partial pressure of oxygen. Diagram, graphs, tables. 12 ref. (D general)

**235-D.** (French.) **Methods for the Determination of the End of Refining in the Basic Bessemer Process, Especially From Samples Taken With a Spoon.** J. Klärding and H. Rohr. *Revue de Métallurgie,* v. 53, no. 2, Feb. 1956, p. 81-91.

Photographs of test pieces were used to determine the end-point of refining and metallurgical conditions during refining. Photographs, graphs, micrographs. 19 ref. (D3, S11, ST)

**236-D.** (French.) **Practical Importance of the Chemical Composition of the Slag From an Efficient Desulfurization in the Openhearth.** Bernhard Matuschka. *Revue de Métallurgie,* v. 53, no. 3, Mar. 1956, p. 205-212; disc., p. 212-214.

Maximum solubility of the slag for the sulfur and the sulfur balance are important considerations. Tables, graphs. 3 ref. (D2, B21, ST)

**237-D.** (French.) **Process of Prerefining of the Melt by Injection of Oxygen-Enriched Air in the Hearth of the Blast Furnace.** Kuro Kanamori. *Revue de Métallurgie,* v. 53, no. 4, Apr. 1956, p. 305-310.

Air at 40% oxygen was injected into the iron, using a three-ton blast furnace equipped with a special nozzle. Diagrams, graphs, table. (D1, CI)

**238-D.** (German.) **The Bloomery Rotary Kiln of the V.E.B. Maxhütte.** Friedrich Linder and Horst Weidermann. *Neue Hütte,* v. 1, no. 5, Mar. 1956, p. 280-292.

Technology, transport of raw materials, charge materials, dust removal equipment, measuring, recording and switching appliances, material and volume flow diagram. Micrographs, photographs, diagrams. 5 ref. (D8, Fe)

**239-D.** (German.) **Technology of Multiple Continuous Casting.** R. Baake and H. Rosahl. *Neue Hütte,* v. 1, no. 5, Mar. 1956, p. 293-302; disc., p. 303.

Principles, comparison with discontinuous process, proposals for use in existing plants, commercial possibilities. Tables, diagrams, photographs, graphs. 6 ref. (D9)

**240-D.** (German.) **The Thermal Conditions in a Continuous Casting Ingot Mold.** Joachim Tischendorf. *Neue Hütte,* v. 1, no. 5, Mar. 1956, p. 303-307.

Influence of vibrations upon heat transfer. Graphs, diagrams. 3 ref. (D9)

**241-D.** (Book.) **Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, Proceedings (Annual Volume),** v. 14, 1955, 378 p. American Institute of Mining and Metallurgical Engineers, 29 West 39 St., New York N. Y.

Papers, abstracted separately, cover various aspects of agglomeration, raw materials, blast furnace theory and operation, coal and coke. (D1, B16, B18, Fe)

# E

## Foundry

**316-E. Hot-Blast Cupola Practice.** Wilhelm L. Heinrichs. *American Foundrymen's Society, Preprint No.* 56-22, 1956, 10 p.

Development of basic-slag cupola practice from cold blast to continuous hot blast operation. Interrelations of the melting process; thermal and metallurgical reactions. Diagram, graphs, photographs, table. 13 ref. (E10)

**317-E. Development of Hot-Blast Cupola Melting Technique in Europe.** Ernst Loebbecke. *American Foundrymen's Society, Preprint No.* 56-33, 1956, 24 p.

Development of hot blast cupola melting techniques in Europe with particular reference to the metallurgical and thermotechnical problems which have primarily influenced this development. Diagrams, graphs, micrographs, photographs, tables. 57 ref. (E10)

**318-E. Risering of Gray Iron Castings.** E. J. Sullivan, Jr., C. M. Adams and H. F. Taylor. *American Foundrymen's Society, Preprint No.* 55-34, 1955, 5 p.

Continued theoretical and experimental studies of the shrinkages of various gray irons have consolidated understanding of the effects of carbon, silicon and other elements on shrinkage behavior, and have clarified the interrelationship between shrinkage, graphite structure and mold dilation. Diagram, graphs, photographs, tables. 2 ref. (E22, CI)

**319-E. Temperature Drop in Pouring Ladles.** Victor Paschkis. *American Foundrymen's Society, Preprint No.* 56-43, 1956, 13 p.

Deals with what is believed to be the greatest single contributing factor to temperature drop in transit from the melting furnace to the mold cavity. Diagrams, graphs, tables. 4 ref. (E23)

**320-E. Effects of Charge Proportions, Furnace Atmosphere Flow Rate, and Melt-Down Time on Properties of Malleable Iron.** A. H. Zrimsek, E. H. Belter and R. W. Heine. *American Foundrymen's Society, Preprint No.* 56-85, 1956, 10 p.

Effect of steel in the charge on chemistry of melting, casting properties, annealability and tensile properties; effect of flow rate of melting furnace atmosphere; effect of melt-down time and melting rate. Graphs, tables. 4 ref. (E10, CI)

**321-E. Melting Malleable Iron With Pulverized Coal and Oil as Fuel.** E. H. Nielsen. *American Foundrymen's Society, Preprint No.* 56-101, 1956, 5 p.

Purpose of the combined application of pulverized coal and oil as a fuel was to reduce oxidation during the melting down, heating up and tapping of the metal. Conclusions show savings in lower oxidation, higher fluidity, more uniform metal and lower cost of charging material. Diagrams, graphs. (E10, CI)

**322-E. Recent Development of the Coreless Line Frequency Induction Melting Furnace in European Foundries.** Otto Junker. *American Foundrymen's Society, Preprint No.* 56-102, 1956, 8 p.

Development and present use of coreless line frequency induction furnaces. Furnace is suitable for nonferrous metals, including magnesium and its alloys, is advantageous for turnings and chips and has found wide use for melting cast iron, particularly spheroidal graphite cast iron. Diagrams, photographs, table. 6 ref. (E10, E25, CI, Mg)

**323-E. Casting Tolerances as Affected by Automation in the Machine Shop.** E. L. Buchman. *American Foundrymen's Society, Preprint No.* 56-103, 1956, 3 p.

Problems resulting from automation with respect to material specifications, maintaining casting tolerances, metal control, raw material control and machinability. (E general, A5, G17)

**324-E. Molding Sands, Molding Methods and Casting Dimensions.** R. W. Heine. *American Foundrymen's Society, Preprint No.* 56-151, 1956, 8 p.

Conditions for controlling dimensions of castings. Diagrams, graphs, photograph. 3 ref. (E18, E19)

**325-E. Does Sand Testing Give Us the Facts?** R. W. Heine, E. H. King and J. S. Schumacher. *American Foundrymen's Society, Preprint No.* 56-152, 1956, 4 p.

A possible solution of correlating values found in testing by standard AFS test methods. Graphs, table. (E18)

**326-E. Green-Sand Casting Finish.** R. F. Meader. *American Foundrymen's Society, Preprint No.* 56-156, 1956, 6 p.

Important factors governing surface finish and closer dimensional tolerance. Graphs. (E11)

**327-E. The Carbon-Dioxide Process.** D. V. Atterton. *American Foundrymen's Society, Preprint No.* 56-162, 1956, 27 p.

Survey of the technical and practical developments of the carbon-dioxide process in Great Britain. Diagrams, graphs, photographs, tables. 12 ref. (E19, E21)

**328-E. Core Making With $CO_2$ Process.** Frank M. Scaggs. *American Foundrymen's Society, Preprint No.* 56-164, 1956, 4 p.

Twelve months experience at one company shows many advantages in the carbon dioxide process for better castings at less cost. Graph, photographs. (E21)

**329-E. Some Considerations on the Tensile and Transverse Strength Testing of Shell Mold and Core Sands.** P. J. Ahearn, F. Quigley, J. I. Bluhm and J. F. Wallace. *American Foundrymen's Society, Preprint No.* 56-168, 1956, 7 p.

Photoelastic evidence indicates excessive nonuniformity of stress distribution both across the critical section and at the gripping points in the standard tensile test briquet currently used for baked core and cured shell mold sand. Mechanical analysis of various tensile tests. Diagram, graph, photographs, tables. 8 ref. (E18, E16)

**330-E. Cold Process for Resin Coated Foundry Sands.** J. E. Bolt. *American Foundrymen's Society, Preprint No.* 56-169, 1956, 7 p.

Survey of the newest and fastest growing technique today in the shell molding field. Micrographs, photographs. 3 ref. (E16)

**331-E. Inorganic Binders Solve Shell Molding Problems.** Jose Navarro and H. F. Taylor. *American Foundrymen's Society, Preprint No.* 56-175, 1956, 10 p.

Problems arising from casting low-carbon steel in shell molds studied from standpoint of lowering mold cost, improving gating and risering technique and producing a more acceptable cast surface. Diagrams, graphs, photographs, tables. 7 ref. (E16)

**332-E. Influence of Sand Distribution and Surface Coatings on Metal Penetration.** *American Foundrymen's Society, Preprint No.* 56-186, 1956, 9 p.

Study of three basic types of nonproprietary core washes and several blends of sand for core specimens. Diagrams, graph, photographs, tables. 5 ref. (E19, E11, E21)

**333-E. New Foundry Process—Single Glass Mold Smoothes Casting Wrinkles.** P. M. Unterweiser. *Iron Age,* v. 177, May 10, 1956, p. 91-94.

New, all-in-one glass molds offer top precision, finer casting definition, blemish-free surface finish and a versatility that permits casting all metals, ferrous and nonferrous, in a common molding material. Photographs. (E16)

**334-E. Gating and Risering of Investment Castings.** C. M. Adams. *Metal Progress,* v. 69, May 1956, p. 58-60.

Gates and risers for investment castings must be designed as if the mold were made from sand and well insulated. Diagrams, graph. (E22, E15)

**335-E.** (Japanese.) **The Improvement in Properties of Molten Iron. I. On the Blow of Oxygen.** Isao Aoki and Tomojiro Tottori. *Iron and Steel Institute of Japan, Journal,* v. 41, no. 4, Apr. 1956, p. 407-411.

Controlled blowing of oxygen into molten iron improves quality of cast iron. Micrographs, graphs, tables. 6 ref. (E10, CI)

**336-E.** (Russian.) **On the Hydrodynamic Theory of Centrifugal Casting.** M. M. Chepinoga. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 3, Mar. 1956, p. 92-105.

Refutes previous solution of the hydrodynamic problem of centrifugal casting and gives new solution for the problem of stationary motion of heavy viscous fluid in a rotating cylinder in the case of high Froude numbers. Table, diagrams, photograph. 3 ref. (E14)

**337-E.** (Russian.) **Study of the Liquation of Copper in Steel by Means of Radioactive Isotopes.** I. R. Krianin, S. N. Smolenskii, M. A. Studnits, and G. I. Babushkina. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 20-22 + 1 plate.

Investigation of zonal activity in a casting. Distribution of copper in various sections of a casting of carbon steel alloyed with copper and in a manganese-silicon-copper steel. Distribution of copper in relation to strength and plasticity. Table, photograms. 5 ref.
(E25, S19, Q23, Cu, ST)

**338-E.** (Spanish.) **The Izurdiaga Furnace for Obtaining Cast Iron From Industrial Ores and Residues.** Jose Antonio Morales Belda and Juan Antonio Berazaluce Altadill. *Instituto del Hierro y del Acero,* v. 9, no. 44, Mar. 1956, p. 241-247; disc., p. 247-249.

Furnace which is characterized by having an alternating circulation of gases in the ascending and descending direction, obtained by means of a single control valve. Furnace is used for producing cast iron on a small scale. Diagrams, photographs. (E10, CI)

**339-E. Melting Equipment for Non-Ferrous Metals.** J. H. Hunt and C. D. Campbell. *Australasian Engineer,* Feb. 1956, p. 53-62.

Main types of nonferrous melting furnaces in use. Furnace requirements, principles, construction, performance, operation and metallurgical characteristics. Photographs, tables, diagrams. 42 ref. (E10, C5)

**340-E. Casting Design for Machine Shop Efficiency.** E. R. Tichauer. *Australasian Engineer,* Mar. 1956, p. 58-63.

Some general principles underlying the production of castings suitable for processing in the modern machine shop. Photographs, diagrams, graphs. (E general)

**341-E. Cupola Slagging Processes and the Water Cooled Cupola Shell.** J. Chappel. *Canadian Metals,* v. 19, May 1956, p. 50 + 3 pages.

Comparison of advantages and disadvantages of rear and front slagging and their relationship to the water-cooled cupola shell. Diagrams. (E10)

**342-E. Running and Gating of Castings.** W. Collinge. *Foundry Trade Journal,* v. 100, Apr. 26, 1956, p. 223-231.

Gating systems and layouts illustrated are applicable to any type of casting of similar design; the metal used has been accommodated successfully in the mold to produce castings free from general defects such as porosity, gas inclusions and scabbing. Photographs. (E22, CI)

**343-E. Outline of Recommended Melting Practices for Small Heats.** Nicholas J. Grant. *Industrial Heating,* v. 23, May 1956, p. 968 + 6 p.

What may be expected from factors of oxidation, hydrogen, deoxidation and temperature control to solve associated problems in melting small heats in induction or carbon-arc furnaces. Tables. (E10)

**344-E. Use of Refractories in Low-Frequency Induction Furnaces for Melting Copper Alloys: I.** Maurice Cook, C. L. M. Cowley and E. R. Broadfield. *Industrial Heating,* v. 23, May 1956, p. 1053 + 4 p.

Construction of a suitable refractory lining and features of furnace design and operation affecting its use. Diagrams. (To be continued.) (E10, Cu)

**345-E. Behavior of Hydrogen in Metals Under the Influence of Direct Current.** D. P. Lovtsov. *Henry Brutcher Translation No.* 3693, 9 p. (Abridged from *Liteinoe Proizvodstvo,* no. 9, 1955, p. 15-19.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 448-E, 1955.
(E25, Al, Mg)

**346-E. Investigations of the Carbon-Dioxide Process.** R. Ziegler and G. Hammer. *Henry Brutcher Translation No.* 3696, 9 p. (From *Giesserei-Nachrichten,* no. 2, May 1955, p. 5-12.) Henry Brutcher, Altadena, Calif.

Insuring optimum core collapsibility and shake-out by control of such factors as fineness of sand, binder content and mulling time. Tables, graphs. (E18, E24)

**347-E.** (German.) **Hot Degassing of Lead Smelts.** Wilhelm Hofmann and Jurgen Maatsch. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 231-239.

Equipment for hot degassing of low-melting metals and the measuring method applied. With lead melts the amount of carbon dioxide and water set free were determined. Tables, graphs, diagram, micrograph. 22 ref. (E25, Pb)

**348-E.** (Italian.) **Collaboration Between the Research Office and the Foundry.** P. Rigaut. *Fonderia,* v. 5, no. 4, Apr. 1956, p. 161-167.

Joint role of research office and foundry in designing pieces and in obtaining samples on which will depend the cost and quality of the final product. Diagrams, photographs. (E general, CI)

**349-E.** (Polish.) **Casting of Iron Alloys in Permanent Molds.** Jozef Kuszewski. *Przeglad Odlewnictwa,* v. 6, no. 3, Mar. 1956, p. 65-71.

Properties of casts made in chill molds including outer appearance, crystalline structure and mechanical properties. Types of castings selected for casting in chill molds, including complex shapes. Design of chill molds, including arrangement of channels and fixed and movable parts. Economy features. Table, diagrams, photographs. 14 ref.
(E12, E23, E25, CI)

**350-E.** (Spanish.) **Molding Sands.** Jose Navarro Alcacer and Jose Antonio Ancres Jimenez. *Instituto del Hierro y del Acero,* v. 9, no. 44, Mar. 1956, p. 277-289.

Properties that a molding sand must possess; examines 16 samples of sands from the Catalana region and discusses differential thermal analysis, dehydration and inhibition curves and refractoriness. Tables, diagrams, micrographs. 21 ref.
(E18)

**351-E. Zirconium in Cast Iron.** E. A. Brandler. *Foundry,* v. 84, June 1956, p. 100-103.

Effects of zirconium ladle inoculation on machinability, structure, hardness and strength. Tables, graph, photograph. 7 ref.
(E25, G17, Q29, Q23, Zr, CI)

**352-E. How Castings Can Fill Automotive Turbine Needs.** Hiram Brown. *Foundry,* v. 84, June 1956, p. 104-107.

Design and casting problems in production of stainless steel turbine parts. Possible substitute alloys to reduce turbine engine costs. Photographs, diagrams, 2 ref.
(E general, T25, SG-h, SS)

**353-E. Processing of Pearlitic Malleable Iron.** Lyle R. Jenkins. *Foundry,* v. 84, June 1956, p. 112-115.

Melting control and heat treatment procedures. Micrographs.
(E10, J23, CI)

**354-E. Detrimental Impurities in Brass Foundry Alloys.** Harry St. John. *Foundry,* v. 84, June 1956, p. 122-125.

Occurrence and treatment of tin, zinc, lead, iron, aluminum, silicon, magnesium, manganese, phosphorus, sulphur, carbon, hydrogen and oxygen. Photograph. (E general, Cu)

**355-E. Patterns and Coreboxes for Shell Mold Castings.** Harry Weaver. *Foundry,* v. 84, June 1956, p. 150 + 4 p.

Design and production details. Photographs. (E16, E17, E21, CI)

**356-E. Dimensionally-Accurate Castings.** J. Hill. *Foundry Trade Journal,* v. 100, May 10, 1956, p. 293-300.

Emphasizes phases of casting manufacture where maximum inaccuracies occur and where control must be established and standard conditions maintained to meet the degree of accuracy required. Graph, diagrams, tables, photographs. 10 ref. (To be continued.) (E 25)

**357-E. Experience With Fast-Drying Bonding Materials.** A. I. Donaldson. *Foundry Trade Journal,* v. 100, May 24, 1956, p. 351-359.

Results of experiments using rapid-drying oil-sand mixtures as a basis for cores. Carbon dioxide process for making molds and cores. Photographs. (E18, E21)

**358-E. Thermal Environment.** D. Turner, W. B. Lawrie, A. Eyden and A. Edwards. *Metal Industry,* v. 88, May 18, 1956, p. 413-416.

Development of a reverberatory furnace for melting light and nonferrous alloys. Diagrams, table. 1 ref. (E10)

**359-E. Continuous Casting of Cast Iron Bars.** G. J. Shaw. *Metal Treatment and Drop Forging,* v. 23, May 1956, p. 165-170.

Casting machines and methods, mold materials and design, mechanism of solidification, experimental casting machine and techniques, closed system of casting. Photograph, diagrams, table. (To be continued.) (E16, D9, CI)

**360-E.** (Czech.) **Selecting Parts Suitable for Precision Casting.** O. Kastanek. *Strojirenstvi,* v. 6, no. 5, May 1956, p. 331-336.

Modern methods of precision casting, their advantages and recent development. Specific features of new technology which must be taken into consideration. Tables, photographs.
(E15)

**361-E.** (French.) **The Uses of Synthetic Resins in the Foundry.** *Fonderie,* no. 123, Apr. 1956, p. 160-164.

Special properties of urea-formaldehyde and phenol-formaldehyde resins. Use of resins in shell molding and manufacture of cores. Graphs. (E18, E16)

**362-E.** (French.) **Production of Silicon Cast Iron by Reduction of Pyrite Ash, Without Agglomeration, in the Slag-Bath Electric Furnace.** Giuseppe Zuliani. *Journal du Four Electrique,* v. 65, no. 2, Mar.-Apr. 1956, p. 59-62.

Operation of furnace, raw materials and production schedule. Diagrams, photographs, tables, graphs.
(E10, CI)

**363-E.** (French.) **Pipes, Shrinkage Holes, and Cavities in Castings.** J. Pascal. *Metallurgie,* v. 88, no. 4, Apr. 1956, p. 347 + 5 pages.

Causes for occurrence in castings and results of long-term experiments. Diagrams, graphs, tables. 11 ref. (E25)

**364-E.** (German.) **Importance of Croning Shell Casting in the Modern Foundry.** Franz Pölzguter. *Giesserei,* v. 43, no. 11, May 24, 1956, p. 270-280.

Fundamentals of method, process and machinery, mechanization for

production. Graph, diagrams, photographs. 40 ref. (E16)

**365-E.** (German.) **Heavy Metals Casting by the Croning Method.** Manfred Lottermoser. *Giesserei,* v. 43, no. 11, May 24, 1956, p. 281-285.

Resin and parting agent consumption; composition of quartz sand-resin mixture; advantages; preparation of shell mold. Tables, diagram, photographs, micrographs. (E16)

**366-E.** (Polish.) **Defect Called a "Cold Drop", in Cast-Iron Castings.** Roman Krzeszewski and Jan Marcinkowski. *Przeglad Odlewnictwa,* v. 6, no. 4, Apr. 1956, p. 104-109.

Problem of classifying this defect. Microstructural peculiarities of the bead or drop. Causes and elimination. Role of oxide formation in development of beads. Micrographs, diagram. 7 ref. (E25, M27, CI)

**367-E.** (Polish.) **Production of Spheroidal Cast Iron With High Elongation.** Jerzy Piaskowski. *Przeglad Odlewnictwa,* v. 6, no. 4, Apr. 1956, p. 110-117.

Survey of foreign and Polish casting methods for making spheroidal cast iron. Mechanical properties, microstructure, heat treatment. Addition of magnesium-base alloy ("electron") scrap. Micrographs, tables, diagrams. 18 ref. (E general, Q general, M27, J general, CI)

**368-E.** (Book.) **Zinc and Light Metal Die-Casting.** 149 p. 1955. European Productivity Agency of the Organisation for European Economic Co-Operation, 2 rue André-Pascal Paris, 16, France. $2.00

Reports observations of inspection team which visited the United States in 1954. Four phases of the industry were covered: die casting machines, die design and die construction; metallurgy; foundry practice; finishing die castings. (E13, Eg-a, Zn)

# F

# Primary Mechanical Working

**127-F. Delayed Cracking of Rolled Ti-150A.** Harold Bernstein, *Metal Progress,* v. 69, May 1956, p. 65-67.

Centerline cracking of warm rolled Ti-150A which occurs after the alloy has cooled to room temperature can be eliminated by a stress-relieving treatment or by proper edge preparation. Photograph. (F23, J1, Ti)

**128-F. Forging Dies and Tools. Factors Affecting Design.** A. Hughes and D. Vallance. *Metal Treatment and Drop Forging,* v. 23, Apr. 1956, p. 135-143.

Various dies and tools for the forging industry, indicating the importance of design and factors affecting it. Diagrams, photographs. (F22)

**129-F. Finished-Forged Gear Teeth Now Used in German Autos.** O. Rieckhoff. *Product Engineering,* v. 27, May 1956, p. 180-183.

By a new process developed in Germany, gear teeth are forged to sufficient accuracy to require no machining. Applications include differentials for all types of motor vehicles and other uses where speeds are relatively low. Materials used, accuracy and costs. Diagrams, graphs, photographs, table. (F22)

**130-F.** (Russian.) **For Speedier Introduction of Economical Profiles in Rolled Iron.** B. S. Shapiro. *Metallurg,* no. 1, Jan. 1956, p. 12-15.

Discusses replacing some of the presently used rolled shapes with more economical lighter profiles. Examples of revised shapes saving labor and material in some cases up to 17%. A special group of bent rolled profiles described. Diagrams, table. (F23)

**131-F.** (Russian.) **Use of Roller Guides in Section Mills.** N. V. Litovchenko. *Metallurg,* no. 2, Feb. 1956, p. 12-15.

Advantages of roller-type entrance and delivery guides in section mills. Rollers reduce friction and wear; at the delivery end, torsion of the processed piece about the longitudinal axis is prevented. Diagrams. (F23)

**132-F.** (Russian.) **Cold Rolling of Stainless Pipes Without Cooling.** S. S. Shaikevich, N. L. Oslon, P. K. Stasevich and A. G. Leveinem. *Stal,* v. 16, no. 4, Apr. 1956, p. 337-342.

Cold rolling of stainless steel tubes not over 48 mm. in diam. can be successfully done without cooling if the rollers do not become heated above their temperature of annealing. Durability of the rollers increases three times, and the over-all efficiency of rolling 21%. Tables, diagrams, photographs. 6 ref. (F26, SS)

**133-F.** (Russian.) **The Effect of Slight Cold Finishing on the Structure and Magnetic Properties of Hot-Rolled Transformer Steel.** B. F. Trakhtenberg. *Stal,* v. 16, no. 4, Apr. 1956, p. 343-347.

Application of cold finishing (4 to 8% reduction) to hot rolled transformer steel results in a decrease of total specific losses by approximately 0.2 to 0.3 watts per kg. Simultaneously, magnetic induction in strong fields is reduced by 1-3% due to changes in the grain size. Diagram, graphs, micrographs, tables. 11 ref. (F23, P15, P16, AY)

**134-F. Intricate Ti Parts Now Forged in Presses.** John P. Wright and Arnold L. Rustay. *American Machinist,* v. 100, May 21, 1956, p. 113-117.

Data on new methods for forging parts having intricate contours, larger in size and calling for critical specifications on mechanical properties; design recommendations and case studies. Micrograph, diagrams, photographs, graphs. (F22, Ti)

**135-F. For Foolproof Lubrication, Spray Your Extrusion Dies.** Donald R. Acklin. *Modern Metals,* v. 12, May 1956, p. 40-41.

New method boosts die life, slashes scrap rate, improves finish, eliminates injuries and reduces lubricant consumption by 50%. Photographs. (F24, F1)

**136-F. The Rolling of Metals and Alloys. X. The Energy Consumed and the Horsepower Developed During Cold Rolling.** E. C. Larke. *Sheet Metal Industries,* v. 33, no. 348, Apr. 1956, p. 259-264.

Approximate methods of calculating energy requirements associated with rolling are illustrated. Tables, diagrams. 1 ref. (To be continued.) (F23)

**137-F. Progress Through Research.** Bruce W. Gonser. *Wire and Wire Products,* v. 31, May 1956, p. 539-540, 597.

Shows the way to better metals and more economical production through research on such problems as uniformity of stock, back tension, process simplification, fatigue and stress relief. Photographs. (F28)

**138-F. The Predetermination of Tensile Strengths in Steel Wire Manufacture.** C. Coates. *Wire and Wire Products,* v. 31, May 1956, p. 549-553, 596.

By control of physical properties and metallurgical treatment, a scheme is proposed for prediction of tensile strength. Tables, graphs, diagram. (F28, Q27, CN)

**139-F. Wire Flattening.** A. Ball. *Wire Industry,* v. 23, May 1956, p. 423 + 6 pages.

Some experiences and problems associated with the cold forming of wire into flat sections. Graph, tables, diagram. (F28)

**140-F.** (French.) **Recent Installations Set Up by the SECIM.** M. Goué. *Centre de Documentation Siderurgigue, Circulaire d'Information Techniques,* v. 13, no. 4, 1956, p. 745-764.

Construction of a rolling mill and a wire-drawing table for special steels. Describes construction of steel plants at Paz del Rio, Colombia and Chimbote, Peru. Photographs. (F23, F28, A5, ST)

**141-F.** (French.) **Flattening of Sheets by Machine.** Pierre Lepeu. *Revue de l'Aluminium,* v. 33, no. 230, Mar. 1956, p. 291-295.

Causes of non-flatness, ways of flattening. Diagrams, photographs. (F29)

**142-F.** (Swedish.) **The Size of the Mill Spring in Hot Rolling.** Gunnar Wallquist and Kurt Gedin. *Jernkontorets Annaler,* v. 140, no. 3, 1956, p. 155-188.

Results from a study of 11 stands. The spring in a mill is broken down into three components: total, specific and spring coefficient. Tables, graphs, diagrams. (F23)

**143-F. A Graphical Solution of the Cold-Rolling Problem, When Tensions are Applied to the Strip.** G. Lianis and Hugh Ford. *Institute of Metals, Journal,* v. 84, Apr. 1956, p. 299-305.

Nomographs cover the practical range of cold rolling conditions with a high degree of accuracy. Tables, graph, nomographs. 12 ref. (F23)

**144-F. Comparison of an Unsymmetric Slip-Line Solution in Extrusion With Experiment.** T. F. Jordan and E. G. Thomsen. *Journal of the Mechanics and Physics of Solids,* v. 4, May 1956, p. 184-190 + 2 plates.

Experimentally determined velocity vectors obtained from the extrusion of tubes of commercially pure lead from solid billets under axial symmetry and plane strain compared with an unsymmetric slip-line solution. Photographs, diagrams. 6 ref. (F24, Q24, Pb)

**145-F. Extrusion Through Square Dies of Large Reduction.** W. Johnson. *Journal of the Mechanics and Physics of Solids,* v. 4, May 1956, p. 191-198.

Slip-line fields for square dies of large reduction; results and expressions for calculating the extrusion pressure for extreme values of friction. Table, graphs, diagrams. 4 ref. (F24)

**146-F. Hot Brass Pressing. Application of the Cored Forging Process.** M. G. Cockcroft. *Metal Treatment and Drop Forging,* v. 23, May 1956, p. 171-178.

Fundamental ideas relating to forging operations in general; open and closed die pressing; procedures, applications and limitations of the cored forging process. Diagrams, photographs. (F22, Cu)

**147-F. Fastest Cold Tandem Mill in Europe.** *Sheet Metal Industries,* v. 33, no. 349, May 1956, p. 307-310.

Principal design features, roll

changing, roll screwdown, coil feeding, interstand equipment, strip coiling, automatic roll cooling and lubrication, air conditioning, and future developments. Photographs. (F23)

**148-F. The Rolling of Metals and Alloys. X. The Energy Consumed and the Horse-Power Developed During Cold Rolling.** *Sheet Metal Industries,* v. 33, no. 349, May 1956, p. 337-342.

Roll-neck bearings, application of horsepower and energy formulas, effect of coiler and decoiler tension on energy and power. Graphs, tables. (To be continued.) (F23)

**149-F. Tooling Heavy Extrusion Presses.** Haskell J. Ross. *Tool Engineer,* v. 36, June 1956, p. 114-116.

Design and use of dies and other tools for heavy-press extrusion of aluminum. Photographs, diagrams, tables. (F24, Al)

**150-F.** (German.) **Influences Upon the Accuracy of Rolling During Hot-Rolling of Sheets and Strips and Their Control by Means of Experiment and Calculation.** O. Emicke and K. H. Lucas. *Neue Hütte,* v. 1, no. 5, Mar. 1956, p. 257-274.

Measurement of the elastic deflection of one special chill roll and two alloyed cast steel rolls on a 1000-ton press under various conditions. Calculation of elastic deformation of rolling stands and their component parts and effects of these influences on thickness differences of rolled plate. Graph, tables, diagrams. 12 ref. (F23, T5, CI)

**151-F.** (Italian.) **Sheet Rolling Operations.** Giacomo Agnelli. *Tecnica italiana,* v. 21, no. 2, Mar. 1956, p. 109-116.

Procedure of mechanical rolling, rolling potential and stress, streching of fibers, rolling equipment. Diagrams, graph, table, photographs. (F23)

# G

## Secondary Mechanical Working

**204-G. Contour-Etching.** *Aircraft Production,* v. 18, May 1956, p. 168-176.

A process for forming aluminum alloys consists of removing metal from delineated areas by immersing the part in a sodium hydroxide solution. Table, diagrams, photographs. (G general, Al)

**205-G. Cold Extrusion Improves Small Parts.** George H. De Groat. *American Machinist,* v. 100, May 7, 1956, p. 156-157.

Wristpin production is an outstanding example of what can be done with cold extrusion. Changeover from machining has resulted in stronger, better parts and higher production rates. Diagrams, photographs. (G5)

**206-G. The Relation Between Grinding Conditions and Thermal Damage in the Workpiece.** R. S. Hahn. *ASME, Transactions,* v. 78, May 1956, p. 807-811; disc., p. 811-812.

Effect of variables such as work speed, feed and wheel characteristics on the instantaneous surface temperature produced and the resulting damage and stress. Diagram, micrographs, graphs. 9 ref. (G18)

**207-G. The Role of Chip Thickness in Grinding.** G. S. Reichenbach, J. E. Mayer, S. Kalpakcioglu and M. C. Shaw. *ASME, Transactions,* v. 78, May 1956, p. 847-857; disc., p. 857-859.

Mathematical analysis of chip thickness as a grinding parameter. Photograph, diagrams, tables, graphs. 15 ref. (G18)

**208-G. Inorganic Grinding Fluids for Titanium Alloys.** M. C. Shaw and C. T. Yang. *ASME, Transactions,* v. 78, May 1956, p. 861-867; disc., p. 867-868.

Dilute aqueous solutions of certain inorganic salts are very effective in decreasing the rate of grinding-wheel wear and providing decreased surface roughness in the finishing of titanium-alloy surfaces. Diagrams, tables. 4 ref. (G21, G18, Ti)

**209-G. The Effect of High-Frequency Vibrations in Grinding.** L. V. Colwell. *ASME, Transactions,* v. 78, May 1956, p. 837-844; disc., p. 844-846.

Small vibrations at high frequencies can improve surface finish, reduce temperature in the ground surface, reduce incidence of thermal cracks, and minimize the effects of variations in hardness within a grinding wheel. Diagram, graphs, micrographs, photographs, table. 3 ref. (G18)

**210-G. Fabrication of Low-Nickel, High-Manganese Stainless Steels.** Richard E. Paret. *Metal Progress,* v. 69, May 1956, p. 54-57.

New series 200 stainless steels can be formed and welded with the same dies, equipment and techniques now used for the higher nickel stainless steels. Greater strength of the new alloys may require some modification in tooling for embossing or extremely precise deep drawing because of a slight increase in springback. Graph, photographs, table. (G general, K general, SS)

**211-G.** (French.) **Some Physico-Chemical Aspects of Oxygen Cutting. I.** Claude Decroly and Guy Genin. *Revue de la Soudure (Brussels)* v. 12, no. 1, Jan. 1956, p. 50-70.

Thermal behavior of hollow cylindrical test pieces in technically pure oxygen; influence of impurities contained in the oxygen on the apparent inflammation temperature; thermal behavior of soft steel test pieces. Diagrams, graphs, tables. (To be continued.) (G22, CN)

**212-G.** (German.) **Machining of Aluminium.** P. Krekel. *Aluminium (Budapest)* v. 32, no. 5, May 1956, p. 276-282.

Describes best machine tools, forms of tool and tool materials, best cutting speeds and feeds and lubricants and coolants. Tables, graph, diagrams. 2 ref. (G17, Al)

**213-G.** (German.) **Studies on Flame-Cutting Procedure.** K. Teske. *Schweissen und Schneiden,* v. 8, no. 4, Apr. 1956, p. 122-129.

Slag temperature, ignition temperature, phase diagram of iron and its oxides, reaction speed. Graphs, diagrams, photographs. 2 ref. (G22, ST)

**214-G.** (German.) **Present State of Our Knowledge in the Field of the Machinability of Iron and Steel.** Franz Rapatz and Franz Motalik. *Stahl und Eisen,* v. 76, no. 8, Apr. 19, 1956, p. 477-485.

Considers wear, surface finish, tool life, structure, strength and sulfur and lead content in relation to machinability. Tables, diagrams, graphs. 64 ref. (G17, Fe, ST)

**215-G.** (Russian.) **Vibration Machining of Plastic Materials.** D. I. Shil'krut. *Doklady Akademii Nauk SSSR,* v. 107, no. 2, Mar. 11, 1956, p. 255-257.

Use of ultrasonic vibration to cut wood and steel. Longitudinal sections are cut from a taut steel wire without its breaking, thus showing how minimal cutting stresses are. Surface of cut is smooth. Photographs. 7 ref. (G17, ST)

**216-G.** (Russian.) **Rolling of Balls.** S. P. Granovskii, B. I. Efanov and A. A. Gromov. *Stal,* v. 16, no. 4, Apr. 1956. p. 333-337.

Advantages of new method of rolling steel balls for grind mills and for bearings over the customary stamping and forging methods. Technology of the new method. Photographs, diagrams, tables. (G11, ST)

**217-G. The Formability of Aluminium Alloys.** D. A. Barlow. *Engineering,* v. 181, May 18, 1956, p. 366-368.

Bending of tubes, solid sections and various shapes. Deep drawing failures; desirable characteristics for metals for deep-draw forming. Diagrams, photograph, graphs, table. 6 ref. (To be continued.) (G6, G4, Al)

**218-G. Coolant Switch Increases Machining Speeds, Tool Life.** Carl Seaburg. *Iron Age,* v. 177, May 31, 1956, p. 62-63.

Methods and advantages in use of synthetic cutting fluid. Photographs. (G21, G17, ST)

**219-G. Wear Analysis of Hard Metal Turning Tools by Means of Radioisotopes.** H. Opitz and O. Hake. *Microtecnic (English Edition),* v. 10, no. 1, 1956, p. 5-9; disc. p. 9.

Measurement of radioactive wear makes it possible to obtain absolute data as to machinability and to draw up machinability graphs. Diagrams, graphs, tables, photograph. 4 ref. (G17, Q9, TS)

**220-G. Metal Working With Stock Removal and Its Effect on the Condition of the Product.** M. Pesante. *Microtecnic (English Ed.),* v. 10, no. 1, 1956, p. 26-30.

Effect of grinding operation on internal stresses, resistance to fatigue and improvement in surface finish. Graphs, micrographs, table. (G18, Q7, Q25, AY)

**221-G. Causes and Control of Distortion During Machining of Aluminum-Alloy Forgings.** Loyl R. Thomas and Harry J. Gilliland. *Steel Processing,* v. 42, May 1956, p. 274-278, 287.

For maximum relief of stress, spars should be specially saw cut by the supplier after forging and prior to solution heat treatment. Tables, diagrams, photographs. (G17, Al)

**222-G. Stretch-Wrap Forming.** Kingsley C. Drone. *Western Machinery and Steel World,* v. 47, May 1956, p. 78-83.

Basic information on 18-year old process; different machines and techniques illustrated. Table, graph, diagrams, photographs. (G9)

**223-G.** (German.) **Deep Drawing of Metal Sheets.** Erich Siebel and Walter Panknin. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 207-212.

Reactions and stresses occurring during deep drawing with punch and die; basis for evaluating the drawing processes currently used in the forming of sheet. "Marform" and "Hydroform" processes. Graphs, diagrams. 23 ref. (G4, G9)

**224-G.** (German.) **Processes of Punching of Nonferrous Metals.** Rudi Dies. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 212-217.

In the perforating of nonferrous metals, the influences exercised by the consistency of the punching material, the surface finish of the punch, by lubrication and clearance between punch and die, on the forces of withdrawing or stripping were determined. These forces are

dependent on the ratio of punch diameter and sheet thickness. Graphs, diagram, photographs, oscillograms. 3 ref. (G2, EG-a)

**225-G.** (German.) **Production of Light Metal Sheet Parts in Automotive Construction.** Erich Dannehl. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 221-223.

The stretching process is particularly suitable for small batches of parts in the automotive industry. A specially developed light metal sheet alloy is used. Diagrams, photographs. (G9, T21, EG-a)

**226-G. The Formability of Aluminium Alloys.** D. A. Barlow. *Engineering,* v. 181, May 11, 1956, p. 329-332.

General analysis of forming by means of stretching, shrinking or compressing operations. Graph, diagrams. 7 ref. (To be continued.) (G general, Al)

**227-G. A Tapping Test for Evaluating Cutting Fluids.** C. D. Flemming and L. H. Sudholz. *Lubrication Engineering,* v. 12, May-June 1956, p. 199-203.

Equipment, conditions and procedure; typical results obtained with both oils and emulsions; correlation of test with actual field performance. Graphs, tables, photographs. 2 ref. (G21)

**228-G. Machining Meehanite Castings.** E. W. Harding and E. M. Trent. *Machinery (London),* v. 88, May 25, 1956, p. 808-817.

Depth of cut has little influence on tool life; cutting speed is most important factor; casting design has direct bearing on machinability and performance of carbide tipped tools. Photographs, diagram, tables, graphs, micrographs. (G17, CI)

**229-G. The Drawing of Titanium.** James S. Kirkpatrick. *Magnesium,* May 1956, p. 2-7.

Methods used successfully with commercially pure metal and the new high-strength alloys. Photographs, diagrams. (G4, Ti)

**230-G. The Use of Die Retainers in Bending Operations.** W. M. Halliday. *Sheet Metal Industries,* v. 33, no. 349, May 1956, p. 295-298.

An efficient and inexpensive form of mechanical retainer. Diagrams. (G6)

**231-G. Problems Solved by Precision Production Grinding.** A. H. Dall. *Tool Engineer,* v. 36, June 1956, p. 76-79.

Grinding equipment, methods of grinding various metals and shapes. Photographs, diagrams. (G18)

**232-G. Tools and Methods for Forming Titanium.** James S. Kirkpatrick. *Tool Engineer,* v. 36, June 1956, p. 85-89.

Equipment and procedures for spinning, drawing and other forming methods. Photographs, diagrams. (G13, G4, Ti)

**233-G. Hot-Spinning Thick-Walled Cylinders Slashes Fabrication Costs.** Don A. Sweet. *Western Metals,* v. 14, May 1956, p. 60-61.

Equipment and methods for spinning aluminum and other metal shapes up to ¼ in. thick. Photographs. (G13, Al)

**234-G.** (Czech.) **Determining the Forces Acting in Cold Extrusion.** F. Hrazdil. *Strojirenstvi,* v. 6, no. 3, Mar. 1956, p. 180-184.

Methods of determining deformation forces: analysis of forces acting in the extruding process, comparison of results obtained by using various formulas. Graphs, diagrams, photographs. 1 ref. (G5)

# H

## Powder Metallurgy

**86-H. Metal Powder Slip Castings.** Henry H. Hausner and Donald P. Ferriss. *Materials & Methods,* v. 43, May 1956, p. 132-134.

Slip casting extends the scope of parts which can be fabricated by powder metallurgy, looks promising for parts having undercuts, reverse curvatures and lateral projections. Photographs. 4 ref. (H14, SS, W, Mo)

**87-H. Preparation and Evaluation of Cr-Ti-O Compositions.** William Arbiter. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 65-68.

High-temperature properties investigated. Poor impact resistance discourages their use for jet engine applications. Tables. 1 ref. (H general, Q6, Cr, Ti)

**88-H. Recent Developments in the Application of Transition Metal Borides.** Arnold Blum and William Ivanick. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 75-78.

Presentation of transition metal borides which, originally developed for aircraft power plant applications, are now being used widely for their outstanding liquid metal corrosion resistance, high-temperature stability in vacuum, superior oxidation resistance and strength at high temperatures. Tables, photograph. (H general, Q general, T24)

**89-H. Production of Transition Metal Diborides and Their Solid Solutions From Metal Oxides and Boron Oxide.** Herman Blumenthal. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 79-81.

Simple and inexpensive production process could be developed into a continuous process, if the necessity for the manufacture of these products on a large scale should arise in the future. Tables. 3 ref. (H general)

**90-H. Cermets and the Problem of Impact Strength.** Frank W. Glaser and N. Grossman. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 90-93.

A systematic testing program was carried out using a series of titanium-carbide base cermet materials containing a nickel-cobalt-chromium alloy as binder in the proportion of 60-20-60. 5 ref. (H general, Q6, Ti)

**91-H. On Vacuum Furnaces With Induction Heating and With Molybdenum Resistor Heating.** W. Hennig and O. Winkler. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 102-107

Construction of sintering furnaces, resistance furnaces with molybdenum heating elements, comparison of power consumption in the two furnace types. Diagrams, graphs, photographs. (H15)

**92-H. The Present Status of Molybdenum Production.** R. Kieffer and F. Benesovsky. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 113-121.

Essential features of three processes by which ingots for the manufacture of semifinished molybdenum parts are obtained: direct sintering, indirect sintering, and high vacuum arc casting. Diagrams, photographs, table. 13 ref. (H15, C5, Mo)

**93-H. Powder Metallurgy and the Fight Against Corrosion.** R. L. Meyer. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 124-129.

Protection of the materials and products of powder metallurgy against corrosion, sintered metallic materials resistant to corrosion and to oxidation at high temperature, use of metal powders in protective coatings. 1 ref. (H general, R general)

**94-H. Powder Metallurgy of Thorium Hydrides.** Samuel Storchheim. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 158-162.

Powder metallurgy of two hydrides, $ThH_3$ and $ThH_x$, where x approaches the value of 4. Graphs, table. 5 ref. (H general, Th)

**95-H. Quality Control of Cemented Carbides.** W. C. Seitz and J. H. Powers. *Tooling and Production,* v. 22, May 1956, p. 93-94, 104.

Primary steps in the manufacture of cemented tungsten carbide outlined and discussed. Diagram, photographs. (H general, W)

**96-H. Powder Metallurgy of Thorium.** G. A. Meyerson. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 188-192.

Calcium reduction of thoria and the subsequent pressing and sintering of thorium powders produced by both calcium reduction and electrolysis. Tables, graphs. (H general, Th)

**97-H. Preparation, Identification and Chemical Properties of the Niobium Germanides.** John H. Carpenter and Alan W. Searcy. *American Chemical Society, Journal,* v. 78, May 20, 1956, p. 2079-2081.

An X-ray diffraction investigation establishes the existence of compounds of compositions $NbGe_{0.07\pm0.05}$, $NbGe_{0.54\pm0.06}$ and $Nb_3Ge$ in addition to $NbGe_2$, which had previously been reported. The compounds were formed by powder metallurgical techniques. Tables. 9 ref. (H general, Cb, Ge)

**98-H. Titanium Powder Metallurgy. I. Present Status of Titanium Powder.** R. F. Bunshah, H. Margolin and I. B. Cadoff. *Precision Metal Molding,* v. 14, May 1956, p. 38-40, 67.

Present status of development. Photographs, tables. (To be continued.) (H general, Ti)

**99-H.** (German.) **Calculation of Pressure Conditions in Powder Metallurgy.** Karl Torkar. *Archiv für das Eisenhüttenwesen,* v. 27, no. 4, Apr. 1956, p. 285-288.

Derivation of an equation expressing pressure conditions in compressing powder to cylindrical compacts. Tables, graphs, diagram. 8 ref. (H14)

**100-H. Investigation of the Powder Metallurgy of Thorium. I.** W. G. Lidman and T. Weissmann. *U. S. Atomic Energy Commission, SEP-138,* 1955, 25 p.

Effect of compacting pressure, sintering time, temperature and atmosphere on the density, hardness, and microstructures of thorium prepared by powder metallurgy. Tables, graphs, micrographs. 2 ref. (H general, Th)

**101-H.** (Polish.) **Sintering of Boron Carbide Under Pressure.** Edmund Bryjak, Witold Missol and Zbigniew Bojarski. *Hutnik,* v. 23, no. 3, Mar. 1956, p. 117-125.

Sintering process of $B_4C$, $B_4C$-Fe, $B_4C$-Si and $B_4C$-FeSi under pressure. Optimal temperature and density. Tables, graphs, diagram, micrographs, diffractograms. 8 ref. (H15, B, C-n)

**102-H.** (Russian.) **Cermet Hard Alloys With Unequal Distribution of the Carbide Component, for the Machining of Abrasive Materials.** G. A. Meerson and G. V. Samsonov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 4, Apr. 1956, p. 121-125.

Relation between wear resistance, brittleness, amount of cementing metal (cobalt), and cermet alloy proportions. Diagram, micrographs, graph, table. 4 ref.
(H general, G17, Q9, C-n, W)

# J

## Heat Treatment

**147-J. Heat Treatment of Gray Cast Iron.** A. H. Rauch and J. B. Peck. *American Foundrymen's Society, Preprint No.* 56-25, 1956, 5 p.

Hardenability of both alloyed and unalloyed irons in the strength range of ASTM Class 25 to Class 35 irons determined by end-quench hardenability test. Effect on hardenability of chromium, nickel and molybdenum, singly and in combination. Conventional Rockwell-C and Brinell tests made on heat-treated gray iron are an integration of the hardness of the graphite and metal matrix. Diagram, graphs, tables. 13 ref. (J26, Q29, CI)

**148-J. Measurement of Stress-Relieving Temperatures of Some Power Plant Steels.** J. D. Murray. *Metal Treatment and Drop Forging,* v. 23, Apr. 1956, p. 131-134.

Method for determining stress-relieving temperature, giving examples of results on some low-alloy molybdenum and chromium-molybdenum steels, and high-alloy steel. Diagram, graphs, photograph, tables. 4 ref. (J1, AY)

**149-J. Effect of Sampling Tube Material on Dew Point Measurements.** P. C. Kirby. *Metal Treatment and Drop Forging,* v. 23, Apr. 1956, p. 153-155.

Some experiments which show the effect of various materials used for the sampling tubes in dew-point measurements for control of atmospheres in heat treatment operations. Graphs. 1 ref. (J2)

**150-J.** (Japanese.) **On the Case Hardening of Steels by Modified Gas Utilizing $O_2$. II. In the Case of Using $CO_2$.** Naoto Shirai. *Iron and Steel Institute of Japan, Journal,* v. 41, no. 4, Apr. 1956, p. 424-429.

Steels of various kinds were heated in a closed vessel containing carbon dioxide and potassium ferrocyanide, and both the powerful carburizing action of the formed atmosphere and the reaction between the cyanide salt and carbon dioxide were studied. Graphs. 2 ref.
(J28, ST)

**151-J.** (Russian.) **High-Frequency Heat Treatment of Camshafts.** S. N. Sizov. *Avtomobil'naia i Traktornaia Promyshlennost',* no. 3, Mar. 1956, p. 32-35.

Recommended frequencies, heating time, cooling conditions, and the like, in the induction heating and hardening of tractor cams and camshafts. Depth and structure (martensite, troostite-martensite, troostite-sorbite zones) of case. Tables, diagrams, photograph. 3 ref.
(J2, CN)

**152-J.** (Russian.) **Quench-Hardening of Machine Tools Made of High Speed Steels Whose Cross Sections Differ Greatly in Dimensions and Profile.** R. P. Leshchinskaia. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 34-46.

Problem of cracking as a result of complex shape of parts is prevented by carefully regulated heating and cooling, particularly in the zone of martensite transformation. Photograph. 6 ref. (J26, N8, TS)

**153-J.** (Russian.) **Formation of Aluminum Nitride During Nitriding.** A. A. Iurgenson. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 50-52.

X-ray and chemical analyses. Plasticity, microstructure, and hardness of nitrided aluminum. Failed to find aluminum nitride after prolonged nitriding of pure aluminum (up to 930 hr.). Micrographs, 3 ref.
(J28, M27, Q23, Q29, Al)

**154-J. Age-Hardening Characteristics of a Cast Alloy of Copper—5.8 Per Cent Titanium.** N. Henner, H. McCurdy and R. Edelman. *American Foundrymen's Society, Preprint No.* 56-1, 1956, 4 p.

Optimum mechanical properties for a cast 5.8% Ti copper alloy were obtained after solution treating at 1625° F., water quenching, and then age-hardening at 800° F. Diagram, graphs, micrographs, table. 13 ref. (J27, Q23, Cu, Ti)

**155-J. Heat-Treatment Technique.** J. W. Oppy. *Australasian Engineer,* Mar. 1956, p. 64-67.

Outline of heat treatment techniques for the steels more commonly used in general engineering practice. Tables. (To be continued.)
(J general, ST)

**156-J. Selection of Steel for Heat Treatment.** K. G. Morrison, *Australasian Engineer,* Feb. 1956, p. 64-67.

Tool and die steels and steels used for the automobile steering knuckle are especially considered. Table. 2 ref. (To be continued.)
(J general, T21, TS, AY)

**157-J. Heat Treating Retaining Rings for Jet Engines.** Arthur G. Portz. *Industrial Heating,* v. 23, May 1956, p. 985 + 4 p.

Production steps in normalizing, hardening and tempering large stainless steel rings. Photographs, table, micrographs. (J general, SS)

**158-J. Automatic Carbon Control for Batch-Type Furnaces.** T. N. Duncan. *Steel Processing,* v. 42, May 1956, p. 283-287.

Furnace, generator and atmosphere control are fully automatic, requiring work handling only for loading and unloading the tray. Tables, micrographs, photographs, diagram. (J2, ST)

**159-J. Furnace For Heat Treatment of Metals in Vacuum.** E. N. Marmer. *Henry Brutcher Translation No.* 3703, 7 p. (From *Metallovedenie i Obrabotka Metallov,* v. 1, no. 6, 1955, p. 36-40.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 96-J, 1956. (J2)

**160-J.** (English.) **Heat-Treatment of Forged Roll Steel.** Yunoshin Imai and Shoshiro Ohara. *Science Reports of the Research Institutes, Tohoku University,* ser. A., v. 7, no. 5, Oct. 1955, p. 469-481.

To determine the conditions of heat treatment favorable to a roll steel containing 0.80% carbon and 1.62% chromium, austempering and martempering were studied. Graphs, tables. (J26, N8, AY)

**161-J.** (Dutch.) **Middle-Frequency Induction Hardening of Steel.** J. W. Geurts. *Smit Mededelingen,* v. 11, no. 1, Jan.-Mar. 1956, p. 21-25.

Power requirements, selection of steel, initial microstructure, carbon content, residual stresses, distortion. Graphs, photographs.
(J2, M27, Q25, ST)

**162-J. The Distortion and Dimensional Instability of Heat-Treated Components.** W. B. Kemmish. *Machinery (London),* v. 88, May 18, 1956, p. 759-764.

Principles of heat treatment of tool steel, causes of dimensional changes, recommendations for avoiding some engineering troubles and production losses. Graphs, micrographs. (J general, TS)

**163-J. Carbonitriding of Small Parts.** J. McMullen and D. R. McHarg. *Metal Treatment and Drop Forging,* v. 23, May 1956, p. 179-184.

Construction and operation of a plant for the heat treatment and case hardening of components for accounting and calculating machines. Micrographs, diagram, photographs, table. (J28, CN)

**164-J. Here's How to Stress Relieve in the Field.** Ronald E. Cannon. *Petroleum Processing,* v. 11, June 1956, p. 74-75.

Six steps to follow; necessary equipment. Diagram, graph, tables.
(J1)

**165-J.** (Czech.) **Hardness and Depth of Nitrided Layer of Cutting Tools.** R. Malik. *Strojirenstvi,* v. 6, no. 3, Mar. 1956, p. 196-199.

Importance of correct thickness of nitrided layer; depth of penetration; basic conditions for obtaining maximum hardness. Graphs. (J28, TS)

**166-J.** (Czech.) **Determining the Carburizing Efficiency of Various Atmospheres.** J. Zboril and I. Sala. *Strojirenstvi,* v. 6, no. 5, May 1956, p. 327-330.

Principles and advantages of various methods, device for testing various atmospheres, relation between electrical resistance and carbon contents. Graphs, diagram, photograph, micrographs. 5 ref.
(J28, J2, ST)

**167-J.** (French.) **Continuous Furnace With Strong Air Stream for the Heat Treatment of Light Metals.** J. Hérenguel, F. Santini and M. Scheidecker. *Revue de Métallurgie,* v. 53, no. 3, Mar. 1956, p. 161-168; disc., p. 168-169.

Metallurgical advantages, with particular reference to restoration annealing, quenching and tempering; design conditions. Photographs, graphs. 4 ref. (J general, EG-a)

# K

## Joining

**288-K. How to Weld Gas-Turbine Alloys.** A. L. Cooper and H. L. Printz. *American Machinist,* v. 100, May 7, 1956, p. 121-126.

Stainless steels and superalloys for aviation gas turbines often produce specialized welding problems; here are materials and procedures that work. Graph, photographs, tables. (K1, T25, SS)

**289-K.** (French.) **Behavior of Pipes for Arc Welded Forced-Air Conduits During Bursting Tests.** E. Folkhard. *Revue de la Soudure (Brussels)* v. 12, no. 1, Jan. 1956, p. 15-27.

Tests to determine influence of materials and processes on the safe-

ty of arc-welded forced-air conduits. Diagrams, photographs, graphs, tables. (K1)

**290-K.** (German.) **Role of Argon in Physical and Metallurgical Processes During Arc Welding.** M. Puschner. *Metall,* v. 10, Nos. 9-10, May 1956, p. 423-427.

Process technology, phenomena in arc, surface and boundary stresses, argon with added oxygen. Table, diagrams, photographs. 3 ref. (K1)

**291-K.** (German.) **Welding Distortions, Especially by Deep Penetration Electrodes.** Horst Pflug. *Schweissen und Schneiden,* v. 8, no. 4, Apr. 1956, p. 115-122.

Measuring set for distortions; performance and evaluation of tests; relationship between maximum bending and location of longitudinal weld axis of symmetry; mechanisms of distortions; equation of bending axis. Tables, graphs, diagrams, photographs. 17 ref. (K1, ST)

**292-K.** (Russian.) **Low-Silicon Fluxes for Automatic Welding and Beading.** I. I. Frumin, D. M. Rabkin, V. V. Podgaetskii, I. K. Pokhodnia and E. I. Leinachuk. *Avtomaticheskaia Svarka,* v. 9, no. 1, Jan.-Feb. 1956, p. 3-20.

Composition and technical characteristics of low-silicon fluxes and methods of their preparation. Use of low-silicon fluxes makes it possible to vary within a wide range the silicon-to-manganese ratio in the metal of the seam. Flux composition affects the structure of the metal and the incidence of crystallization fissures. Tables, graph, diagram, photograph, micrographs. 16 ref. (K1, ST)

**293-K.** (Russian.) **Problems of Technology of Automatic Welding of Aluminum With Melting Electrode.** D. M. Rabkin and M. L. Zvonkov. *Avtomaticheskaia Svarka,* v. 9, no. 1, Jan.-Feb. 1956, p. 21-28.

Technology, techniques and apparatus used in semishielded arc welding of aluminum with a melting electrode. Optimum data on welding aluminum 4 to 25 mm. thick. Table, graphs, photographs, diagrams. 4 ref. (K1, Al)

**294-K.** (Russian.) **Laws Governing the Process of Welding Under Plastic Deformation.** L. A. Fridliand, T. A. Amfiteatroval and V. A. Petrunichev. *Avtomaticheskaia Svarka,* v. 9, no. 1, Jan.-Feb. 1956, p. 38-46.

Plastic deformation occurring in spot and butt pressure welding; mechanical properties of joints depending on temperature of the metal and on deformation. Graphs, diagrams, tables. 3 ref. (K3, Q general)

**295-K.** (Russian.) **Basic Laws Governing the Transfer of Fluxing Material From the Electrode to the Seam in Arc Welding and Coating of Steels.** A. A. Erokhin. *Svarochnoe Proizvodstvo,* no. 4, Mar. 1956, p. 4-9.

Main loss during the transfer of fluxing material from the electrode to the seam is due to chemical reactions, primarily to oxidation. Losses vary with additives and may be reduced through the use of deoxidizing agents. Tables, graphs. 32 ref. (K1, ST)

**296-K.** (Russian.) **The Effect of Arc Length on the Mechanical Properties of Fused-On Metal in Welding With Austenite Electrodes.** V. S. Aristov and V. I. Sheiko. *Svarochnoe Proizvodstvo,* no. 4, Mar. 1956, p. 9-12.

Increasing the length of arc in welding with austenite electrodes leads to a considerable increase in nitrogen concentration in the seam metal, resulting in a change in its mechanical properties. Diagrams, tables, graphs. 2 ref. (K1, Q general, SS)

**297-K.** (Russian.) **The Effect of the Shape of Die on the Strength of the Spot Joint in Cold Welding of Aluminum.** K. K. Khrenov and G. P. Sakhatskii. *Svarochnoe Proizvodstvo,* no. 4, Mar. 1956, p. 12-14.

Experimental data on the strength of spot joints cold welded with dies of various shapes; advantages of cold welding over riveting. Diagrams, tables, graphs, photographs. 2 ref. (K5, Al)

**298-K.** (Russian.) **Properties of Welded and Soldered Joints in KhN78T Alloy.** V. A. Gorokhov. *Svarochnoe Proizvodstvo,* no. 4, Mar. 1956, p. 17-18.

Alloys with additional molybdenum, aluminum and columbium components can be arc-welded or soldered with heat resistant solder but not gas-welded due to reduction of strength of the material near the seam because of heating. Micrographs, table, graphs. (K1, K7)

**299-K.** (Russian.) **Spot Welding of Contacts in Starting and Control Devices.** B. M. Nekrasov and I. M. Radashkovich. *Svarochnoe Proizvodstvo,* no. 4, Mar. 1956, p. 18-22.

Welding of silver and powdered metal contacts calls for the use of spot welding machines with precise regulation of electrode pressure (25 to 100 kg.) and high welding current. Diagrams, photograph, table, micrograph. (K3, Ag)

**300-K.** **Hot Crack Testing of Weld Metal Deposits.** J. W. Shedden. *Australasian Engineer,* Mar. 1956, p. 68-73.

Existing test methods and their limitation; a new test where a weld bead is deposited during the actual bending of the test specimen. Tables, photographs. 14 ref. (K9)

**301-K.** **Good Control Makes Titanium Welding a Shop Tool.** F. D. Seaman. *Iron Age,* v. 177, May 31, 1956, p. 64-66.

Comparison of various methods for welding and brazing titanium, weldability tests. Welding with inert gas tungsten electrode appears best joining method. Photograph, tables. (K1, K3, K9, K8, Ti)

**302-K.** **High-Strength Adhesives for Metal Bonding.** R. F. Blomquist. *Machine Design,* v. 28, May 31, 1956, p. 99-103.

An engineering review of current requirements for adhesives, bonding-process specifications and joint design. Photographs, table, diagrams. 19 ref. (K12)

**303-K.** **New Low Cost Method for Speedier Brazing.** Harold Prince. *Sheet Metal Industries,* v. 33, no. 348, Apr. 1956, p. 253-258.

Method involves integration of a whole battery of machines and operations, so eliminating processes and minimizing the roles of the remaining operations. Graph, diagrams, tables, photographs. (To be continued.) (K8)

**304-K.** **Structure of Weld Metal Studied by Autoradiography.** B. I. Bruk. *Henry Brutcher Translation No.* 3715, 11 p. (Abridged from *Svarochnoe Proizvodstvo,* no. 11, 1955, p. 8-13.) Henry Brutcher, Altadena, Calif.

Review of current Russian theories about layer formation and the nature of segregation in weld metal. Sulphur-35 is used as autoradiographic tracer. Graph, photographs, micrographs. 12 ref. (K9, M23, AY)

**305-K.** (French.) **The Repair of Ship Shafts by Welding.** *Soudage et Techniques Connexes,* v. 10, nos. 3-4, Mar.-Apr. 1956, p. 60-64.

Repair of soft or semihard forged, cylindrical ship shafts in the case of a tail-shaft bracket corroded under the sleeve or near the propeller, a counter-shaft having a metal defect, and a counter-shaft to correct a mistake in machining. Photographs. 1 ref. (K1, ST)

**306-K.** (French.) **French Developments in Argon Welding With a Fusible Electrode.** L. Dumoulin. *Soudage et Techniques Connexes,* v. 10, nos. 3-4, Mar.-Apr. 1956, p. 87-97; disc., p. 97-98.

Possibilities offered by argon welding for aluminum and copper and their alloys, stainless steels, and soft steels; absence of solid flux, high rate of deposition, semi-automatic process, visibility of arc, and high-quality welds. Photographs. (K1, ST, Al, Cu, SS)

**307-K.** **The Effect of Surface Treatment on the Properties of Adhesive-Bonded Joints in Metals.** J. A. Edwards. *Sheet Metal Industries,* v. 33, no. 349, May 1956, p. 311-314, 322.

Adsorbed film and adhesion, metal thickness, surface treatments for stainless steel, magnesium and titanium, and magnesium joints. Graph, tables. (K12, SS, Mg, Ti)

**308-K.** **A Straight-Polarity, Inert-Gas Process for Welding Mild Steel.** J. M. Cameron and A. J. Baeslack. *Welding Journal,* v. 35, May 1956, p. 445-449.

Process is made possible by addition of metallic-oxide coating to surface of electrode, and is characterized by high metal deposition rates, good penetration and good arc stability. Macrographs, graphs, tables, diagrams, photographs. 1 ref. (K1, ST)

**309-K.** **Resistance Welding Ductile Joints in Commercially Pure Titanium.** R. Wickham. *Welding Journal,* v. 35, May 1956, p. 463-467.

High-ductility resistance welds can be produced provided all welding variables are closely controlled. Tables, photographs. (K3, Ti)

**310-K.** **Thermal Efficiency in Arc Welding.** J. ter Berg and A. Larigaldie. *Welding Journal,* v. 35, May 1956, p. 252S-254S.

Using a special calorimeter, the different energies which play a role during arc welding were determined separately. Table, diagram. 7 ref. (K1)

**311-K.** **Effect of Irradiation on Weldability of ASTM A212, Grade B.** Wendell R. Hutchinson. *Westinghouse Electric Corporation, Bettis Plant (U. S. Atomic Energy Commission),* WAPD-153, Feb. 1956, 32 p.

The only factor observed which might influence the quality of a weld on irradiated material was the encumbrance of the welder with additional clothing and safety procedures and the resultant psychological effects on the quality of his work. Diagrams, tables. 25 ref. (K9, A7, AY)

**312-K.** (Czech.) **Aluminum and Copper Cold Pressure Butt-Welding.** Jiri Hoskovec and Vaclav Pilous. *Zvaranie,* v. 4, no. 12, Dec. 1956, p. 357-365.

Theories of mechanism of union in cold pressure welding. Role of deformation and cleaning of surfaces. Welding aluminum with aluminum, aluminum with copper, copper with iron, and other combinations. Strength, fatigue, hardness

and corrosion tests. Electrical resistance of weld. Photographs, diagrams, tables, graphs, micrographs. 6 ref.
(K5, Q general, R general, Al, Cu)

**313-K.** (German.) **Effect of Welding Methods on Design.** K. Bobek. *Schweissen und Schneiden,* v. 8, no. 5, May 1956, p. 152-158.

Suggestions for selection of welding method for various metals and construction types. Tables, diagrams, photographs. (K general)

**314-K.** (German.) **Induction-Welding of Pipes in Construction of Boilers and Apparatuses.** O. Niezoldi, E. Jöllenbeck and W. Stenger. *VDI Zeitschrift,* v. 98, no. 14, May 1956, p. 818-823.

Principles and process of induction welding, properties of joints thus welded. Photographs, tables, diagrams, micrographs. 9 ref. (K6)

**315-K.** (Italian.) **Technology of Brazing and Soldering.** Mario Macuz. *Tecnica Italiana,* v. 21, no. 2, Mar. 1956, p. 73-84.

Processes are defined and physical and chemical phenomena taking place in the formation of joints illustrated. Diagrams, photographs. 17 ref. (K8, K7)

**316-K.** (Russian.) **Temperature Distribution in the Bath During Automatic Welding of Aluminum.** D. M. Rabkin. *Avtomaticheskaia Svarka,* v. 9, no. 2, Mar.-Apr. 1956, p. 1-11.

Determined with submerged thermocouples. Influence of welding rate, voltage and temperature of basic metal on distribution of temperature in the bath. Diagrams, photographs, graphs, tables. 4 ref.
(K1, Al)

**317-K.** (Russian.) **The 13Kh3GNMA Welding Rod for Automatic Welding of 30KhGSA Steel.** T. M. Slutskaia. *Avtomaticheskaia Svarka,* v. 9, no. 2, Mar.-Apr. 1956, p. 12-17.

An alloy for automatic welding which provides a uniformly strong weld in steel. The thermally treated joint is crackproof and can attain a yield strength of 110 to 120 kg. per sq. mm. Tables, diagram, photograph, micrograph. 4 ref. (K1, ST)

**318-K.** (Russian.) **Influence of the Welding Method on the Joint Area in Commercial Titanium.** S. M. Gurevich. *Avtomaticheskaia Svarka,* v. 9, no. 2, Mar.-Apr. 1956, p. 18-21.

The influence of linear energy of welding on the structure of the overheated portion of the joint area in commercial titanium. Graph, micrograph. 4 ref. (K1, Ti)

**319-K.** (Russian.) **Automatic Butt Welding of Stainless Steel Pipes.** N. Iu. Pal'chuk and A. I. Akulov. *Avtomaticheskaia Svarka,* v. 9, no. 2, Mar.-Apr. 1956, p. 27-34.

The technology and techniques of argon-shielded arc welding of pipe from 57 to 89 mm. diam. Welded joints possess good mechanical properties and a high corrosion resistance. Diagrams, tables, photographs. (K1, SS)

**320-K.** (Russian.) **Study and Application of Automatic Arc Beading of Parts With an Oscillating Electrode.** I. R. Patskevich and G. D. Kulikov. *Svarochnoe Proizvodstvo,* no. 5, May 1956, p. 6-12.

Compares a previously suggested allegedly "resistance beading" method employing oscillating electrodes with a newly proposed method of arc beading with the aid of an oscillating electrode; discusses its advantages. Tables, diagrams, graphs, photographs. 3 ref. (K3, K1)

**321-K.** (Russian.) **Automatization of the Guidance of the Welding Head Along the Butt.** I. L. Brinberg and P. G. Rybalko. *Svarochnoe Proizvodstvo,* no. 5, May 1956, p. 12-17.

A tracing system for automatic regulation of the motion of the welding head along spiral butts, securing a welding rate up to 200 m. per hr. Diagrams, photographs. 12 ref. (K1)

**322-K.** (Russian.) **The Removal of Oxide Inclusions From the Contact Area in Resistance Flash Welding.** A. S. Gel'man. *Svarochnoe Proizvodstvo,* no. 5, May 1956, p. 17-19.

Removal of oxides from the contact area requires that, at the moment of upsetting, the edges be covered with molten metal throughout the whole area of contact; other details. Diagram, micrograph, table, graphs. 3 ref. (K3, ST)

**323-K.** (Russian.) **Technology of Arc Welding Thin Sheet Steels in a Carbon Dioxide Medium.** F. E. Tret'iakov, A. B. Karan, and S. N. Valeev. *Svarochnoe Proizvodstvo,* no. 5, May 1956, p. 20-22.

Discusses experimental $CO_2$-shielded automatic and manual arc welding of stainless and low-alloy steel sheets 1 to 2.5 mm. thick. Substitution of carbon dioxide for argon makes shielded arc welding 8 to 10 times cheaper. Photographs, tables, diagrams, graphs. (K1, AY, SS)

**324-K.** (Spanish.) **Electric Arc Welding. III.** *Ciencia y Técnica de la Soldadura,* v. 6, no. 29, Mar.-Apr. 1956, 12 pages.

Fundamentals and present developments in electric arc welding in Germany, Switzerland, France, Belgium, England, Italy, the United States and Spain. Diagrams, graph. (K1)

**325-K.** (Spanish.) **New Developments in the Electric Resistance Welding of Light Alloys.** G. Moressée. *Ciencia y Técnica de la Soldadura,* v. 6, no. 29, Mar.-Apr. 1956, 22 p.

Processes and equipment; applications of method in aeronautical, railroad and automobile industries; special materials and their applications in these industries. Graphs, tables, diagrams, photographs.
(K3, EG-a)

**326-K.** (Book.) **Handbook of Fastening and Joining of Metal Parts.** Vallory H. Laughner and Augustus D. Hargan. 622 p. 1956. McGraw-Hill Book Co., 330 W. 42 St., New York, 36, N. Y. $15.00

The objective of this book is to provide the design engineer with both a reference and an idea source covering all known methods of joining metal parts including fitted fastenings, welds and adhesive joining. (K general)

# L

## Cleaning, Coating and Finishing

**442-L. Electroplating on Beryllium.** J. G. Beach and C. L. Faust. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-732, Apr. 1952, 46 p.

One method involves electrochemical and chemical activation of the beryllium surfaces for direct plating with metals, the other involves the application of a replacement film of zinc on the beryllium surfaces followed by strike plating with copper or nickel from baths suitable for plating on zinc. Diagram, graph, tables, micrographs. 7 ref.
(L17, Be)

**443-L. Electroplating on Zirconium and Zirconium-Tin.** W. C. Schickner, J. G. Beach and C. L. Faust. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-757, July 1952, 17 p.

Methods for producing nickel and other coatings by combining electroplating procedures with diffusion heat treatment. Table. 2 ref.
(L17, L15, Sn, Zr)

**444-L. Bismuth-Alloy Coatings on Aluminum.** H. A. Saller, J. R. Keeler, D. L. Keller and J. G. Beach. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-835, May 1953, 23 p.

Several methods for obtaining a 0.004-in. thick high-bismuth alloy layer on the flat surface of an aluminum target. Best results obtained by electroplating alternate layers of nickel and bismuth, followed by diffusion heat treatment. Graph, micrographs, photographs, tables.
(L17, L15, Bi, Ni, Al)

**445-L. Recent Navy Experience With Saran and Vinyl Coatings.** W. W. Cranmer. *Corrosion,* v. 12, May 1956, p. 245-246.

Use of the materials justified in cases where a heavy duty coating resistant to fuels and salt water was necessary and short periods of moderately elevated temperatures were to be encountered. In addition to reducing corrosion, use of the coating simplified cleaning of tanks. 1 ref.
(L26, R4)

**446-L. Calcium Plumbate. A Post-War Development in Anti-Corrosive Paint Pigments.** N. J. Read. *Corrosion Technology,* v. 3, Apr. 1956, p. 119-123.

Like red lead it provides protection by a combination of basic and oxidizing characteristics, as well as film-forming properties by interaction with linseed oil. Photographs, tables. 2 ref. (L26)

**447-L. Porcelain Enamel Manufacturing Processes.** G. H. McIntyre. *Industrial Finishing* (London), v. 9, Apr. 1956, p. 492-495.

Porcelain enameling practices with the primary aspects of the manufacturing steps. Tables. 4 ref. (L27)

**448-L. Anti-Fouling Paint Studies.** J. B. Ballentine, W. H. Stewart, Marvin O. Yeiter and A. L. Alexander. *Industrial Finishing* (London), v. 9, Apr. 1956, p. 497-499, 501-503.

Investigation of inherent errors in leaching rate measurements. Tables. (L26)

**449-L. Protection Against Corrosion. II. The Ground Metal and Its Coating.** P. Morisset. *Industrial Finishing (London),* v. 9, Apr. 1956, p. 507-510.

Shows that a metallic coating only has significance if its thickness is specified. Anodic and cathodic coatings, as well as the various factors promoting a good corrosion resistant coating are covered. Diagrams, graphs. 5 ref. (L19, L21, R general)

**450-L. Surface Treatment and Finishing of Light Metals. VIII. Hard Anodizing.** S. Wernick and R. Pinner. *Metal Finishing,* v. 54, May 1956, p. 52-55.

Hard anodizing is an alternative to hard chromium plating; it has made possible the use of aluminum alloys in such components as pistons, cylinders and cylinder liners, hydraulic equipment, buffers, gas-turbine engine components and gears. Production methods for thick and hard anodic coatings. Diagrams, graphs. (To be continued.) (L19)

**451-L. Conversion Coatings for Titanium.** P. D. Miller, R. A. Jefferys and H. A. Pray. *Metal Progress,* v. 69, May 1956, p. 61-64.

Both conversion and anodic coatings on titanium alloys hold lubricants efficiently and eliminate or reduce galling in forming operations and in applications involving metal-to-metal contact. Graphs, tables. (L14, Ti)

**452-L. Controlled Sputtering of Metals by Low-Energy Hg Ions.** Gottfried K. Wehner. *Physical Review,* v. 102, ser. 2, May 1, 1956, p. 690-704.

Sputtering studied under well-controlled conditions by immersing the target in a low-pressure mercury plasma of high density created in a pool-type vacuum arc. Diagrams, graphs, micrographs, photographs, table. 28 ref. (L25, Hg)

**453-L. Chromizing of Powder Metallurgy Products (Sinterings).** Richard P. Seelig and Richard L. Wachtell. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 153-154.

Chromizing, a high-temperature chemical reaction plus diffusion process during which chromium is alloyed with the surface of the part being treated, is finding growing commercial acceptance on wrought, cast and molded ferrous metal parts. Photographs. 1 ref. (L15, H12, Cr)

**454-L. Finishing Methods for Aluminum Bronze Gravity Die-Castings.** A. C. Street. *Product Finishing,* v. 9, Apr. 1956, p. 48-53.

Composition details, casting problems and corrosion resistance of the alloy; preparatory treatments, painting, bronzing and electroplating; designing for good surface finish. Diagram, photographs. (L12, L17, L26, Cu)

**455-L. Elementary Topics for Research in Metal Finishing. I. Electroplating Pre-treatments.** C. James. *Product Finishing,* v. 9, Apr. 1956, p. 54-62.

Research is needed on solvent, aqueous alkali and emulsion cleaning; acid dips and pickles; transfer of the work from cleaning processes to the electrolyte. Graphs, tables. (To be continued.) (L12)

**456-L. Pickling Processes Reviewed. VI. Treating Zinc, Cadmium, Magnesium and Aluminium.** D. J. Fishlock. *Product Finishing,* v. 9, Apr. 1956, p. 63-70, 112.

Light acid immersion treatments for improving corrosion resistance and surface finish of electroplated zinc and cadmium; preparation of magnesium for painting and electroplating; pickling, cleaning, etching, and polishing aluminum and its alloys. Photographs. (L12, Al, Zn, Cd, Mg)

**457-L. Temporary Protective Coatings. III. Hot Dip Compositions.** E. Strong. *Product Finishing,* v. 9, Apr. 1956, p. 71-79.

The use of hot dip wax and plastic compositions for safeguarding small, fragile components against severe mechanical shock. Graphs, tables, diagrams. (To be continued.) (L26)

**458-L.** (Russian.) **Mechanism of the Electrolytic Deposition of Metal on a Passivated Surface.** L. I. Kadaner and A. Kh. Masik. *Doklady Akademii Nauk SSSR,* v. 107, no. 2, Mar. 11, 1956, p. 276-279 + 1 plate.

Comparison of electrolytic deposition of lead coating on passivated and unpassivated metal surfaces with respect to corrosion resistance. Micrographs, diffractograms, oscillograms. 11 ref. (L17, R10, Pb, Fe, Cu)

**459-L.** (Polish.) **Red-Lead Paints and a Quick Method for Their Determination.** Z. Klonowski and M. Knopf. *Przemysl Chemiczny,* v. 12, no. 3, Mar. 1956, p. 151-167.

A quick potentiometric method for determining rust-preventing value of red-lead paints for grounding iron. Tables, graphs, photographs. 12 ref. (L26, R11, ST)

**460-L.** (Russian.) **Use of Beryllium Oxide for the Beryllization of Steel.** V. A. Parfenov. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 17-19.

Diffusion beryllization of steel is shown to be feasible. Protection against wear and chemical corrosion at high temperatures. Microstructure, depth and hardness of beryllium diffusion layer. Graphs, micrographs, photographs. 4 ref. (L15, Q9, M26, ST)

**461-L.** (Russian.) **Oxygen Over-Voltage Tension on Nickel Electrode at High Current Density.** Ia. I. Tur'ian and I. S. Gol'denshtein. *Zhurnal Prikladnoi Khimii,* v. 29, no. 3, Mar. 1956, p. 379-384.

Investigation of the oxygen over voltage on a nickel anode in a 7.5 *N* solution of potassium hydride at high-current density 0.04 to 10 amp. per sq.cm., and at temperatures from 0 to 85° C. Table, graph, diagram. 12 ref. (L17, Ni)

**462-L.** (Spanish.) **Obtaining Steel Coatings by Chromium Diffusion.** Jose Saenz Insaust. *Instituto del Hierro y del Acero,* v. 9, no. 44, Mar. 1956, p. 250-257.

Method consists in depositing chromium in the gaseous phase on the surface of pieces placed in a chromizing mixture in a closed vessel and heated in a furnace with any heating system. Theory of process and structure of coating obtained. Micrographs, graphs, photographs, diagram. 10 ref. (L15, ST, Cr)

**463-L.** (Spanish.) **Contribution to the Study of the Electropolishing of Steel With Alternating Current.** Sebastian Feliu and Manuel Serra. *Instituto del Hierro y del Acero,* v. 9, no. 44, Mar. 1956, p. 325-332.

In baths made up of phosphoric acid mixed with certain organic substances, a study was made of electropolishing steel with alternating current at 50 cycles per sec. Tables, graphs. 10 ref. (L13, ST)

**464-L. Chromalloy Surfacing.** Edward Magder. *Canadian Metals,* v. 19, May 1956, p. 58, 60.

Chromium diffusion coating procedures, properties of coatings. Micrograph, table. (L15, Cr)

**465-L. The Electrodeposition of Tin-Cadmium Alloys From Fluoride-Fluosilicate Solutions.** A. E. Davies. *Institute of Metal Finishing, Bulletin,* v. 6, Spring 1956, p. 31-42.

Investigation of the composition of tin-cadmium alloys electrodeposited from electrolytes containing stannous fluosilicate, cadmium fluosilicate, ammonium fluoride and certain nonionic organic compounds. The composition is shown to be a function of current density, cadmium and stannous tin concentration. Table, graphs. 7 ref. (L17, Cd, Sn)

**466-L. The Electrodeposition of Tin-Cadmium Alloys From Stannate-Cyanide Solutions.** A. E. Davies. *Institute of Metal Finishing, Bulletin,* v. 6, Spring 1956, p. 43-58.

Smooth adherent deposits of tin-cadmium alloys were obtained from hot solutions of sodium stannate, cadmium cyanide, sodium cyanide and sodium hydroxide. Substitution of potassium salts for sodium salts leads to increased cathode efficiency. Graphs, tables. 5 ref. (L17, Cd, Sn)

**467-L. The Chemical Treatment of Nickel, Nickel-Chromium and Chrome-Iron Alloy Prior to Electrodeposition.** E. Morley. *Institute of Metal Finishing, Bulletin,* v. 6, Spring 1956, p. 59-61.

Reduction by cathodic treatment of the oxide film which is formed when the work has been treated anodically. Tables. (L21, Ni, Cr, Fe)

**468-L. Is Tin-Nickel the New Plating Finish You Need?** R. T. Gore and F. A. Lowenheim. *Iron Age,* v. 177, May 31, 1956, p. 59-61.

Methods and bath composition for tin-nickel plating, advantages and properties of coatings. Photographs. (L17, Sn, Ni)

**469-L. Loss of Water of Hydration From Phosphate Coatings Determined Radiometrically.** Stanley L. Eisler, Jodie Doss and W. Dennis McHenry. *Organic Finishing,* v. 17, May 1956, p. 5-9.

Steel specimens were phosphated in each of four different baths containing tritium, and activity measurements were made after heating cycles at various temperatures. Graphs, photograph. 7 ref. (L14, ST)

**470-L. Electrophoretic Application of Organic Finishes.** J. J. Shyne. *Organic Finishing,* v. 17, May 1956, p. 12-14.

Procedures for electrophoretic deposition of resins from aqueous and nonaqueous suspensions; merits of both types of suspensions. Diagram, graph, table. 17 ref. (L26)

**471-L. Industrial Applications for Vinyl Resin Finishes.** Frank A. Rideout. *Organic Finishing,* v. 17, May 1956, p. 15-20.

Vinyl copolymer properties; solvents for vinyl coatings; hot spray application of vinyl maintenance paint; plasticizers, pigmentation and primers; dispersion coatings. Table, photographs. (L26)

**472-L. Study of Corrosion and Wear Resistance of Calorized Steel.** S. G. Bogdanov. *Henry Brutcher Translation No.* 3684, 10 p. (From *Metallovedenie i Obrabotka Metallov,* no. 3, 1955, p. 25-31.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 120-L, 1956. (L15, R5, R3, Q9, ST)

**473-L.** (Dutch.) **Surface Treatment of Magnesium.** T. v. d. Klis. *Metalen,* v. 11, no. 6, Mar. 1956, p. 133-139.

Standard procedures for cleaning, pickling, protecting and specially treating the magnesium surface. Tables, diagram. (L general, Mg)

**474-L.** (Finnish.) **Painting of Steel Structures in Industrial Atmospheres.** Veikko Tolvanen. *Teknillisen Kemian Aikakauslehti,* v. 13, no. 5, Mar. 15, 1956, p. 139 + 4 pages.

Corrosion inhibition by the action of red lead, lead cyanamide, zinc chromate and zinc tetra-oxychromate in anticorrosion paints. Paint application, surface preparation, pretreatment, actual painting and requirements to be met by surrounding influences when paint is being applied in industrial areas. (To be continued.) (L26, ST)

**475-L.** (German.) **Adhesion of Iron-Saturated Molten Zinc to Copper-Containing Iron.** Dietrich Horstmann. *Archiv für das Eisenhüttenwesen,* v. 27, no. 4, Apr. 1956, p. 231-233.

Adhesion of iron-saturated molten zinc increases significantly with the copper content in steels. The copper

content is of no influence in galvanizing. Table, graphs, micrographs. 6 ref. (L16, Zn, Fe, Cu)

**476-L.** (Italian.) **Zinc-Powder-Base Antirust Paint for Protection.** Giulio Binetti. *Metallurgia Italiana,* v. 48, no. 3, Mar. 1956, p. 71-86.

Describes paint, its high content of zinc powder, preparation and anticorrosion properties. Photographs, diagrams, graphs. (L26, Fe, Zn)

**477-L. Aluminum Paint: The Stability of Leafing.** Gunter W. Wendon. *Corrosion Prevention and Control,* v. 3, May 1956, p. 33-37.

Synthetic and natural resins, drying oils, solvents and thinners, driers, bituminous media, and suitability testing, considered in relation to correct manufacture of aluminum paint. 9 ref. (L26, Al)

**478-L. Recent Developments in Metal Spraying.** *Corrosion Prevention and Control,* v. 3, May 1956, p. 38-42.

Applications, wear resistance, uses, porosity effects, choice of fuel gas, recent specifications. Photographs. 14 ref. (To be continued.) (L23, Al, Zn)

**479-L. Corrosion Problems on the Texas Gulf Coast. I.** A. D. Rust. *Corrosion Technology,* v. 3, May 1956, p. 134-137.

The painting program at a chemical plant. Table, diagram, photographs. (L26, R3)

**480-L. Lanolin—as a Temporary Protective.** H. Silman. *Corrosion Technology,* v. 3, May 1956, p. 138-140, 153.

Lanolin is compared with various oils and greases as a rust preventive coating. Photographs, table. 4 ref. (L26)

**481-L. An Experimental Investigation of the Metal Spraying Process.** A. Matting and K. Becker. *Electroplating and Metal Finishing,* v. 9, May 1956, p. 147-148, 153.

Theory of coating formation. Micrographs. 57 ref. (L23)

**482-L. A Manufacturing Development: The Gyrofinishing Process for Polishing Metal Surfaces.** George R. Squibb and Fred T. Hall. *General Motors Engineering Journal,* v. 3, May-June 1956, p. 64-68.

Process essentially consists of submerging the parts to be finished in a revolving mass of free abrasive material. Photographs. (L10)

**483-L. Protection Against Corrosion. III. The Use of Metallic Coatings.** P. Morisset. *Industrial Finishing (London),* v. 9, May 1956, p. 569-574.

Properties of electrodeposited coating metals and conditions under which they are likely to be used. Tables. 4 ref. (L17)

**484-L. Developments in Sprayed Metal Coatings.** Herbert S. Ingham. *Product Engineering,* v. 27, June 1956, p. 194-197.

Advances in the design of powder spray guns now permit economical spraying of metal alloys and ceramic materials. Comparison of guns, discussion of fusing, properties of alloys sprayed by the new equipment. Photographs, tables, diagrams. (L23, L27)

**485-L. Simple, Rapid Sputtering Apparatus.** Richard B. Belser and Walter H. Hicklin. *Review of Scientific Instruments,* v. 27, May 1956, p. 293-296.

Description of apparatus which deposits opaque films of nickel and the noble metals in 3 to 10 min. Diagram, table. 20 ref. (L25, Ni, EG-c)

**486-L. Metal Spraying With Rockets.** J. W. Buffington and J. A. Browning. *Welding Journal,* v. 35, May 1956, p. 468-471.

Rocket metallizer can control average particle size over the range 20 to 200 $\mu$. Propane and similar fuels are used. Micrographs, graphs, diagrams, photographs. (L23)

**487-L. Alumina Coating on Ramjet Chamber, Flameholder Beats Heat Barrier.** Alan V. Levy. *Western Metals,* v. 14, May 1956, p. 66-67.

Applications and properties of flame-sprayed coating. Photographs, tables. (L27)

**488-L.** (German.) **Black Stains in Dry Zinc Plating.** K. Zimmermann. *VDI Zeitschrift,* v. 98, no. 12, Apr. 1956, p. 559.

Preparation of flux for galvanizing. Effect of aluminum inclusions. (L16, Zn)

**489-L.** (Russian.) **Investigation of Chromium-Plating Baths of Combined Type.** N. T. Drobantseva and A. N. Sysoev. *Zhurnal Prikladnoi Khimii,* v. 29, no. 4, Apr. 1956, p. 589-595.

Effect of $H_2SiF_6$ and other additions to the chromic acid on thickness and texture of chromium deposits. Relation of current density and temperature to yield for standard and combined baths. Diagram, micrographs, graph. 14 ref. (L17, Cr)

**490-L.** (Book-German.) **Hull Paint and Ship Coating Compounds.** Manfred Ragg. 412 p. 1955. Wilhelm Pansegrau Verlag, Berlin-Wilmersdorf, Uhlandstrasse 102, West Berlin, Germany.

Practical data on ship corrosion, its prevention and causes. Types of antifouling and antiplankton compounds, their substitution, solubility, and analyses, with reference to pontoons, corrosion on ships, docks, buoys, fresh-water ships and so forth. (L26, R4, R10)

# M

## Metallography, Constitution and Primary Structures

**219-M. Grain Size Chart of Uranium.** H. A. Saller, R. F. Dickerson and G. E. Lind. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-66, June 1951, 14 p.

Specimens of each desired grain size were prepared and photographed using both polarized light and bright field illumination. Table, micrographs. (M27, U)

**220-M. Autoradiographic Methods in Powder Metallurgy.** G. F. Huettig and G. Glawitsch. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 108-112.

Characteristics of autoradiographic pictures; availability of isotopes; resolving power of radiographs; sensitivity of the autoradiographic procedure. Diagrams, micrographs, table, autoradiographs. 5 ref. (M23, H general)

**221-M. Contribution to the Problem of Bonding in Solids.** H. Nowotny and H. Reichel. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 130-133.

Effect of chemical bonding on X-ray spectra was used to determine the bonding character in different alloys. X-ray emission as well as absorption spectra can serve for this purpose. Photograph, table. 7 ref. (M26)

**222-M. Structures and Structural Relations of Refractory Metallic Compounds.** Erwin Parthe. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 138-145.

Study of the structures of refractory hard metals with the aim of supplying general laws and structural relationships which should permit the prediction of new high-melting compounds in systems so far not investigated and which should thereby indicate direction of future research work. Graphs, diagram, table. 11 ref. (M26, EG-d)

**223-M. A New Ternary Boride: $Cr_4NiB_2$.** Benjamin Post, Egon Pipitz and William H. Herz. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 149-152.

Systematic investigation of the system Cr-Ni-B. Several compositions between $M_3B_4$ and $MB_2$, and close to $M_3B_4$, were studied. Tables. 2 ref. (M26, H general, B)

**224-M. An Electron Diffraction Examination of Thin Films of Aluminium and Gold Prepared by Vacuum Evaporation.** T. B. Rymer. *Royal Society, Proceedings,* v. 235, ser. A, Apr. 24, 1956, p. 274-288.

Results were interpreted by assuming the crystals to be large and to contain a sessile dislocation. Observations provide an interesting example of a dislocation arising during the growth of a crystal being revealed by diffraction experiments. Diagrams, graphs, tables. 8 ref. (M26, N16, Al, Au)

**225-M. Dislocation in Crystalline Solids.** N. F. Mott. Paper from "Surveys in Mechanics". Cambridge University Press. p. 32-63 + 5 plates.

A general survey of what has been achieved by the study of dislocations. Micrographs, graphs, diagrams. 66 ref. (M26)

**226-M.** (French.) **Dislocations and Plastic Properties of a Solid.** J. Philibert. *Métaux, Corrosion-Industries,* v. 31, no. 368, Apr. 1956, p. 153-166.

Theoretical elastic limit, whiskers, brittle fracture, movement of dislocations, strain aging and formation of Cottrell clouds. Graphs, micrographs, tables, diagrams. 19 ref. (M26, Q21, Q23)

**227-M.** (French.) **Construction and Improvement of a Precision Chamber for Making High-Temperature X-Ray Diagrams.** René Diament. *Métaux, Corrosion-Industries,* v. 31, no. 368, Apr. 1956, p. 167-187.

Improved apparatus for studying refractory alloys, minimizing temperature adjustment and increasing precision in determining crystallographic constants. Diagrams, photograph, micrograph, graphs, tables, x-ray diagrams. 14 ref. (M22)

**228-M.** (German.) **Some Suggestions for Application of the Electron Microscope in Metallography.** E. Brüche and H. Poppa. *Metall,* v. 10, Nos. 9-10, May 1956, p. 415-419.

Methods of application, grain boundary in microfield, slip bands, desintegration (working) planes, roughness determination. Diagram, micrographs. 1 ref. (M21, M27, Q24, S15)

**229-M.** (German.) **Electronic Theoretical Investigations of Defects in Metals. II. Association Energy of Vacancy Couples (Lattice) in Monovalent Metals and in Transition Metals.** Alfred Seeger and Helmut Bross. *Zeitschrift für Physik,* v. 145, no. 2, 1956, p. 161-183.

Calculating method. Ellipsoidal potential as well as a model for double lattice holes in metal. Friedel's condition. Numerical results. Tables, graph, diagrams. 33 ref. (M26)

**230-M.** (Russian.) **Some Data on the Equilibrium Diagram of the Chromium-Niobium System.** V. P. Eliutin

and V. F. Funke. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 3, Mar. 1956, p. 68-76. + 2 plates.

Research data on chromium-niobium alloys. A liquidus and a solidus line are plotted on the equilibrium diagram of the chromium-niobium system. Tables, graphs, micrographs, phase diagram. 4 ref. (M24, Cr, Cb)

**231-M.** (Russian.) **Study of a Copper-Chromium-Zirconium Phase Diagram.** M. V. Zakharov, M. V. Stepanova and V. M. Glazov. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 23-27 + 2 plates.

Temperature and shift of binary and ternary phase boundaries. Relation between temperature and solubility of chromium and zirconium in copper. Microstructural analyses. Table, phase diagrams. 12 ref. (M24, Cu, Cr, Zr)

**232-M.** (Russian.) **Structure of Superconductors. IX. X-Ray Determination of the Structure of $\alpha$-$Bi_2Rh$.** V. P. Glagoleva and G. S. Zhdanov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* v. 30, no. 2, Feb. 1956, p. 248-251.

Structure of low-temperature modification. Lattice peculiarities, position of bismuth and rhodium atoms, interatomic distances and electronic density series. Diagrams, tables. 4 ref. (M26)

**233-M.** (Russian.) **Reaction of Salts With Metals in the Fused State. Interaction in the System $PbCl_2$-Mg-$MgCl_2$+Pb.** A. P. Palkin and V. T. Redchenko. *Zhurnal Neorganicheskoi Khimii,* v. 1, no. 1, Jan. 1956, p. 133-144.

Ternary system phase diagrams, crystallization temperatures, substitution reactions. Diagrams, graphs, tables, phase diagrams. 17 ref. (M24, Pb, Mg)

**234-M.** (Russian.) **Study of the Ternary Phase Diagram of the Ni-$Ni_3Nb$-$Ni_3Ta$ System.** I. I. Kornilov and E. N. Pylaeva. *Zhurnal Neorganicheskoi Khimii,* v. 1, no. 2, Feb. 1956, p. 308-316 + 1 plate.

Thermal and chemical analysis of alloys of the system. Fusibility diagram. Solubility limit of the solid solution of niobium and tantalum in nickel. Graphs, tables, micrographs, phase diagram. 7 ref. (M24, Ni, Cb, Ta)

**235-M. Temper Embrittlement of Steel Studied Under Electron Microscope.** N. V. Kazakova and N. V. Koroleva. *Henry Brutcher Translation No.* 3702, 5 p. (From *Doklady Akademii Nauk SSSR,* v. 105, no. 6, 1955, p. 1233-1235.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 107-M, 1956. (M21, Q23, AY)

**236-M.** (English.) **The Structure of Oxide Films on Different Faces of a Single Crystal of Copper.** Kenneth R. Lawless and Allan T. Gwathmey. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 153-163.

Composition and structure of oxide films formed on electropolished single crystals studied for eight different crystal faces, using X-ray diffraction techniques. Diagrams, tables, graphs. 16 ref. (M26, Cu)

**237-M.** (English.) **Structural Relationships Between Intermetallic Compounds.** P. J. Black. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 172-179.

Structural features of aluminum-rich transition metal compounds correlated and classified. Tables, diagrams. 43 ref. (M26, Al)

**238-M.** (English.) **Physical Evidence of Dislocations in Chromium.** M. J. Fraser, D. Caplan and A. A. Burr. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 186-196.

Chromium sheet, thermally etched at 1300 and 1500° C. in purified hydrogen, was found to exhibit a number of surface structures which are conceived as resulting from the presence of dislocations. Micrographs. 36 ref. (M26, Cr)

**239-M.** (English.) **On the Coupled Dislocations Along a Grain Boundary.** Yasutada Uemura. *Physical Society of Japan, Journal,* v. 11, no. 5, May 1956, p. 479-484.

By analyzing interesting patterns of the etch-pits due to coupled dislocations along a grain boundary in germanium crystals, direct and quantitative verification of the law of interaction between edge dislocations is obtained. Diagrams, tables, graphs, micrographs. 5 ref. (M26)

**240-M.** (English.) **Electron Microscopic Study on the Structure of Mosaic Boundaries in Ni-Mn Single Crystal.** Tadami Taoka and Shoichiro Aoyagi. *Physical Society of Japan, Journal,* v. 11, no. 5, May, 1956, p. 522-527.

The mosaic boundary is composed of a set of parallel edge dislocations which are regularly spaced on some crystal lattice planes and are stable in the crystal. Table, graph, diagram, micrographs. 11 ref. (M26, Ni, Mn)

**241-M.** (English.) **Equilibrium of Solid Phases in Cu-Mn Binary System.** Masayuki Kawasaki, Kenkichi Yamaji and Osamu Izumi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 5, Oct. 1955, p. 443-454.

Equilibrium investigated by observing changes in various physical properties, especially in high-manganese alloys. Micrographs, graphs. (M24, P general, Cu, Mn)

**242-M.** (German.) **Theory of Noble Metals.** K. Ladanyi. *Acta Physica Academiae Scientiarum Hungaricae,* v. 5, no. 4, 1956, p. 361-380.

Investigation of bonds between noble metals on basis of statistical theory developed by Gombas. Calculated data are in concordance with experimental results. Tables, graphs. 8 ref. (M general)

**243-M.** (German.) **Physics of Crystals.** Z. Gyulai. *Acta Physica Academiae Scientiarum Hungaricae,* v. 5, no. 4, 1956, p. 425-443.

New phenomena of plastic deformation of crystals. Plastic and elastic deformations of $Na_2S_2O_8$ crystals. Rotation phenomers in their solution. Diagrams, photographs, graphs, micrographs, ultra-violet spectra. 10 ref. (M26, Q24)

**244-M.** (German.) **Determination of Structural Variations in Cast Iron by Means of Color Photography.** Gabrielle Aubrion. *Giesserei,* v. 43, no. 9, Apr. 26, 1956, p. 203-210.

Application of common and special etching compounds, use of cold and hot etchants, solving practical structural problems and detection of defective material. Micrographs. 8 ref. (M21)

**245-M.** (German.) **Application of Radio-Isotopes in the Science of Materials.** K. Sauerwein. *Metall,* v. 10, nos. 9-10, May 1956, p. 387-393.

Irradiation methods, radiography, use of tagged atoms in metallurgy. Tables, diagram, photographs, radiographs. 8 ref. (M23, S19)

**246-M.** (German.) **Electron Spectrograph for Physical Investigation of Metal.** Walter Dietrich, Heinrich Düker and Gottfried Möllenstedt. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 240-242.

An electrostatic analyzer of high resolving power suitable for investigating the velocity spectrum of 50-kv. electrons. Graph, photographs, diagram, spectrograms. 14 ref. (M22)

**247-M.** (German.) **Contribution to Formation of Systems Vanadium-Silicon and Columbium-Silicon.** Richard Kieffer, Friedrich Benesovsky and Hans Schmid. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 247-253.

Alloys are made by sintering under pressure, by converting powdery mixtures into solid material with the aid of argon, and by melting the metals in electric arc furnaces. These silicides are not very hard and are not scale-resistant. Tables, micrographs, phase diagrams. 31 ref. (M24, H general, C21, V, Si, Cb)

**248-M.** (German.) **Determination of Particle Sizes and Lattice Deformation by Means of X-Ray Interference.** Viktor Hauk and Christoph Hummel. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 254-260.

Influence of cold pressing of cast iron and steel on particle size and lattice distortions of ferrite crystals investigated by measuring X-ray interferences with a goniometer combined with a Geiger counter. Tables, graphs. 36 ref. (M22, M26, CI, ST)

**249-M. The Constitution Diagram of Uranium-Rich Uranium-Molybdenum Alloys.** H. A. Saller, F. A. Rough and D. A. Vaughan. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-72, June 1951, 31 p.

Gamma uranium forms by a peritectic reaction from liquid and delta phases at about 1285° C. and 42 at. % molybdenum. Its solubility decreases with decreased temperature to 28 to 30% at 575 to 600° C., when it transforms to an intermetallic phase, designated as "epsilon". Diagram, tables, micrographs, graphs. 8 ref. (M24, U, Mo)

**250-M. Phase Relations in the Uranium-Zirconium-Oxygen Systems Involving Zirconium and Uranium Dioxide.** Henry A. Saller, Frank A. Rough, Joseph M. Fackelmann, Arthur A. Bauer and J. Robert Doig. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1023, July 1955, 30 p.

A portion of the system, including uranium dioxide and zirconium and related phase regions, was studied at 1000, 1300 and 2000° F. Tentative isothermal sections were established for each of these temperatures. Diagrams, micrographs, tables. 5 ref. (M24, Zr, U)

**251-M. The Constitution of the Titanium-Tin System in the Region 0-25 Atomic Per Cent. Tin.** M. K. McQuillan. *Institute of Metals, Journal,* v. 84, Apr. 1956, p. 307-312.

Below about 1050° C. the diffusion rate in titanium-tin alloys is exceptionally slow; equilibrium cannot be achieved in most alloys below 900° C., even after many months of heating. Tables, graphs. 17 ref. (M24, N1, Ti, Sn)

**252-M. The Constitutional Diagram of the System Chromium-Beryllium From 0 to 70 Atomic Per Cent Beryllium.** A. R. Edwards and S. T. M. Johnstone. *Institute of Metals, Journal,* v. 84, Apr. 1956, p. 313-317.

Diagram was investigated by thermal analysis, X-ray diffraction and metallographic methods, and found

content is of no influence in galvanizing. Table, graphs, micrographs. 6 ref. (L16, Zn, Fe, Cu)

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**220-M. Autoradiographic Methods in Powder Metallurgy.** G. F. Huettig and G. Glawitsch. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 108-112.

Characteristics of autoradiographic pictures; availability of isotopes; resolving power of radiographs; sensitivity of the autoradiographic procedure. Diagrams, micrographs, table, autoradiographs. 5 ref. (M23, H general)

**221-M. Contribution to the Problem of Bonding in Solids.** H. Nowotny and H. Reichel. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 130-133.

Effect of chemical bonding on X-ray spectra was used to determine the bonding character in different alloys. X-ray emission as well as absorption spectra can serve for this purpose. Photograph, table. 7 ref. (M26)

**222-M. Structures and Structural Relations of Refractory Metallic Compounds.** Erwin Parthe. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 138-145.

Study of the structures of refractory hard metals with the aim of supplying general laws and structural relationships which should permit the prediction of new high-melting compounds in systems so far not investigated and which should thereby indicate direction of future research work. Graphs, diagram, table. 11 ref. (M26, EG-d)

**223-M. A New Ternary Boride: $Cr_4NiB_2$.** Benjamin Post, Egon Pipitz and William H. Herz. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 149-152.

Systematic investigation of the system Cr-Ni-B. Several compositions between $M_3B_4$ and $MB_2$, and close to $M_3B_4$, were studied. Tables. 2 ref. (M26, H general, B)

**224-M. An Electron Diffraction Examination of Thin Films of Aluminium and Gold Prepared by Vacuum Evaporation.** T. B. Rymer. *Royal Society, Proceedings,* v. 235, ser. A, Apr. 24, 1956, p. 274-288.

Results were interpreted by assuming the crystals to be large and to contain a sessile dislocation. Observations provide an interesting example of a dislocation arising during the growth of a crystal being revealed by diffraction experiments. Diagrams, graphs, tables. 8 ref. (M26, N16, Al, Au)

**225-M. Dislocation in Crystalline Solids.** N. F. Mott. Paper from "Surveys in Mechanics". Cambridge University Press. p. 32-63 + 5 plates.

A general survey of what has been achieved by the study of dislocations. Micrographs, graphs, diagrams. 66 ref. (M26)

**226-M.** (French.) **Dislocations and Plastic Properties of a Solid.** J. Philibert. *Métaux, Corrosion-Industries,* v. 31, no. 368, Apr. 1956, p. 153-166.

Theoretical elastic limit, whiskers, brittle fracture, movement of dislocations, strain aging and formation of Cottrell clouds. Graphs, micrographs, tables, diagrams. 19 ref. (M26, Q21, Q23)

**227-M.** (French.) **Construction and Improvement of a Precision Chamber for Making High-Temperature X-Ray Diagrams.** René Diament. *Métaux, Corrosion-Industries,* v. 31, no. 368, Apr. 1956, p. 167-187.

Improved apparatus for studying refractory alloys, minimizing temperature adjustment and increasing precision in determining crystallographic constants. Diagrams, photograph, micrograph, graphs, tables, x-ray diagrams. 14 ref. (M22)

**228-M.** (German.) **Some Suggestions for Application of the Electron Microscope in Metallography.** E. Brüche and H. Poppa. *Metall,* v. 10, Nos. 9-10, May 1956, p. 415-419.

Methods of application, grain boundary in microfield, slip bands, desintegration (working) planes, roughness determination. Diagram, micrographs. 1 ref. (M21, M27, Q24, S15)

**229-M.** (German.) **Electronic Theoretical Investigations of Defects in Metals. II. Association Energy of Vacancy Couples (Lattice) in Monovalent Metals and in Transition Metals.** Alfred Seeger and Helmut Bross. *Zeitschrift für Physik,* v. 145, no. 2, 1956, p. 161-183.

Calculating method. Ellipsoidal potential as well as a model for double lattice holes in metal. Friedel's condition. Numerical results. Tables, graph, diagrams. 33 ref. (M26)

**230-M.** (Russian.) **Some Data on the Equilibrium Diagram of the Chromium-Niobium System.** V. P. Eliutin

and V. F. Funke. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 3, Mar. 1956, p. 68-76. + 2 plates.

Research data on chromium-niobium alloys. A liquidus and a solidus line are plotted on the equilibrium diagram of the chromium-niobium system. Tables, graphs, micrographs, phase diagram. 4 ref. (M24, Cr, Cb)

**231-M.** (Russian.) **Study of a Copper-Chromium-Zirconium Phase Diagram.** M. V. Zakharov, M. V. Stepanova and V. M. Glazov. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 23-27 + 2 plates.

Temperature and shift of binary and ternary phase boundaries. Relation between temperature and solubility of chromium and zirconium in copper. Microstructural analyses. Table, phase diagrams. 12 ref. (M24, Cu, Cr, Zr)

**232-M.** (Russian.) **Structure of Superconductors. IX. X-Ray Determination of the Structure of $\alpha$-$Bi_2Rh$.** V. P. Glagoleva and G. S. Zhdanov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* v. 30, no. 2, Feb. 1956, p. 248-251.

Structure of low-temperature modification. Lattice peculiarities, position of bismuth and rhodium atoms, interatomic distances and electronic density series. Diagrams, tables. 4 ref. (M26)

**233-M.** (Russian.) **Reaction of Salts With Metals in the Fused State. Interaction in the System $PbCl_2$-Mg-$MgCl_2$+Pb.** A. P. Palkin and V. T. Redchenko. *Zhurnal Neorganicheskoi Khimii,* v. 1, no. 1, Jan. 1956, p. 133-144.

Ternary system phase diagrams, crystallization temperatures, substitution reactions. Diagrams, graphs, tables, phase diagrams. 17 ref. (M24, Pb, Mg)

**234-M.** (Russian.) **Study of the Ternary Phase Diagram of the Ni-$Ni_3Nb$-$Ni_3Ta$ System.** I. I. Kornilov and E. N. Pylaeva. *Zhurnal Neorganicheskoi Khimii,* v. 1, no. 2, Feb. 1956, p. 308-316 + 1 plate.

Thermal and chemical analysis of alloys of the system. Fusibility diagram. Solubility limit of the solid solution of niobium and tantalum in nickel. Graphs, tables, micrographs, phase diagram. 7 ref. (M24, Ni, Cb, Ta)

**235-M. Temper Embrittlement of Steel Studied Under Electron Microscope.** N. V. Kazakova and N. V. Koroleva. *Henry Brutcher Translation No.* 3702, 5 p. (From *Doklady Akademii Nauk SSSR,* v. 105, no. 6, 1955, p. 1233-1235.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 107-M, 1956. (M21, Q23, AY)

**236-M.** (English.) **The Structure of Oxide Films on Different Faces of a Single Crystal of Copper.** Kenneth R. Lawless and Allan T. Gwathmey. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 153-163.

Composition and structure of oxide films formed on electropolished single crystals studied for eight different crystal faces, using X-ray diffraction techniques. Diagrams, tables, graphs. 16 ref. (M26, Cu)

**237-M.** (English.) **Structural Relationships Between Intermetallic Compounds.** P. J. Black. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 172-179.

Structural features of aluminum-rich transition metal compounds correlated and classified. Tables, diagrams. 43 ref. (M26, Al)

**238-M.** (English.) **Physical Evidence of Dislocations in Chromium.** M. J. Fraser, D. Caplan and A. A. Burr. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 186-196.

Chromium sheet, thermally etched at 1300 and 1500° C. in purified hydrogen, was found to exhibit a number of surface structures which are conceived as resulting from the presence of dislocations. Micrographs. 36 ref. (M26, Cr)

**239-M.** (English.) **On the Coupled Dislocations Along a Grain Boundary.** Yasutada Uemura. *Physical Society of Japan, Journal,* v. 11, no. 5, May 1956, p. 479-484.

By analyzing interesting patterns of the etch-pits due to coupled dislocations along a grain boundary in germanium crystals, direct and quantitative verification of the law of interaction between edge dislocations is obtained. Diagrams, tables, graphs, micrographs. 5 ref. (M26)

**240-M.** (English.) **Electron Microscopic Study on the Structure of Mosaic Boundaries in Ni-Mn Single Crystal.** Tadami Taoka and Shoichiro Aoyagi. *Physical Society of Japan, Journal,* v. 11, no. 5, May, 1956, p. 522-527.

The mosaic boundary is composed of a set of parallel edge dislocations which are regularly spaced on some crystal lattice planes and are stable in the crystal. Table, graph, diagram, micrographs. 11 ref. (M26, Ni, Mn)

**241-M.** (English.) **Equilibrium of Solid Phases in Cu-Mn Binary System.** Masayuki Kawasaki, Kenkichi Yamaji and Osamu Izumi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 5, Oct. 1955, p. 443-454.

Equilibrium investigated by observing changes in various physical properties, especially in high-manganese alloys. Micrographs, graphs. (M24, P general, Cu, Mn)

**242-M.** (German.) **Theory of Noble Metals.** K. Ladanyi. *Acta Physica Academiae Scientiarum Hungaricae,* v. 5, no. 4, 1956, p. 361-380.

Investigation of bonds between noble metals on basis of statistical theory developed by Gombas. Calculated data are in concordance with experimental results. Tables, graphs. 8 ref. (M general)

**243-M.** (German.) **Physics of Crystals.** Z. Gyulai. *Acta Physica Academiae Scientiarum Hungaricae,* v. 5, no. 4, 1956, p. 425-443.

New phenomena of plastic deformation of crystals. Plastic and elastic deformations of $Na_2S_2O_8$ crystals. Rotation phenomers in their solution. Diagrams, photographs, graphs, micrographs, ultra-violet spectra. 10 ref. (M26, Q24)

**244-M.** (German.) **Determination of Structural Variations in Cast Iron by Means of Color Photography.** Gabrielle Aubrion. *Giesserei,* v. 43, no. 9, Apr. 26, 1956, p. 203-210.

Application of common and special etching compounds, use of cold and hot etchants, solving practical structural problems and detection of defective material. Micrographs. 8 ref. (M21)

**245-M.** (German.) **Application of Radio-Isotopes in the Science of Materials.** K. Sauerwein. *Metall,* v. 10, nos. 9-10, May 1956, p. 387-393.

Irradiation methods, radiography, use of tagged atoms in metallurgy. Tables, diagram, photographs, radiographs. 8 ref. (M23, S19)

**246-M.** (German.) **Electron Spectrograph for Physical Investigation of Metal.** Walter Dietrich, Heinrich Düker and Gottfried Möllenstedt. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 240-242.

An electrostatic analyzer of high resolving power suitable for investigating the velocity spectrum of 50-kv. electrons. Graph, photographs, diagram, spectrograms. 14 ref. (M22)

**247-M.** (German.) **Contribution to Formation of Systems Vanadium-Silicon and Columbium-Silicon.** Richard Kieffer, Friedrich Benesovsky and Hans Schmid. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 247-253.

Alloys are made by sintering under pressure, by converting powdery mixtures into solid material with the aid of argon, and by melting the metals in electric arc furnaces. These silicides are not very hard and are not scale-resistant. Tables, micrographs, phase diagrams. 31 ref. (M24, H general, C21, V, Si, Cb)

**248-M.** (German.) **Determination of Particle Sizes and Lattice Deformation by Means of X-Ray Interference.** Viktor Hauk and Christoph Hummel. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 254-260.

Influence of cold pressing of cast iron and steel on particle size and lattice distortions of ferrite crystals investigated by measuring X-ray interferences with a goniometer combined with a Geiger counter. Tables, graphs. 36 ref. (M22, M26, CI, ST)

**249-M. The Constitution Diagram of Uranium-Rich Uranium-Molybdenum Alloys.** H. A. Saller, F. A. Rough and D. A. Vaughan. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-72, June 1951, 31 p.

Gamma uranium forms by a peritectic reaction from liquid and delta phases at about 1285° C. and 42 at. % molybdenum. Its solubility decreases with decreased temperature to 28 to 30% at 575 to 600° C., when it transforms to an intermetallic phase, designated as "epsilon". Diagram, tables, micrographs, graphs. 8 ref. (M24, U, Mo)

**250-M. Phase Relations in the Uranium-Zirconium-Oxygen Systems Involving Zirconium and Uranium Dioxide.** Henry A. Saller, Frank A. Rough, Joseph M. Fackelmann, Arthur A. Bauer and J. Robert Doig. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1023, July 1955, 30 p.

A portion of the system, including uranium dioxide and zirconium and related phase regions, was studied at 1000, 1300 and 2000° F. Tentative isothermal sections were established for each of these temperatures. Diagrams, micrographs, tables. 5 ref. (M24, Zr, U)

**251-M. The Constitution of the Titanium-Tin System in the Region 0-25 Atomic Per Cent. Tin.** M. K. McQuillan. *Institute of Metals, Journal,* v. 84, Apr. 1956, p. 307-312.

Below about 1050° C. the diffusion rate in titanium-tin alloys is exceptionally slow; equilibrium cannot be achieved in most alloys below 900° C., even after many months of heating. Tables, graphs. 17 ref. (M24, Ni, Ti, Sn)

**252-M. The Constitutional Diagram of the System Chromium-Beryllium From 0 to 70 Atomic Per Cent Beryllium.** A. R. Edwards and S. T. M. Johnstone. *Institute of Metals, Journal,* v. 84, Apr. 1956, p. 313-317.

Diagram was investigated by thermal analysis, X-ray diffraction and metallographic methods, and found

to comprise a eutectic system between the chromium-rich solid solution and an intermediate phase based on $CrBe_2$. Table, graphs, diagrams. 15 ref. (M24, Cr, Be)

**253-M. Low Temperature Dilatometry of Uranium.** Henry L. Laquer and Adam F. Schuch. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission),* LAMS-1358, Jan. 1952, 14 p.

A study of the length changes of uranium with temperature, in the interval from room temperature to that of boiling hydrogen, discloses that uranium has a negative expansion coefficient and perhaps a phase change between 20 and 50° K. Tables, graphs. 6 ref. (M23, P11, U)

**254-M. Some Empirical-Theoretical Considerations of Uranium Nitride in Zirconium.** Bernard Kopelman. *U. S. Atomic Energy Commission, Research and Development Report,* SEP-32, Dec. 1949, 17 p.

Reactions of zirconium and uranium, examination of prepared samples, tests applied as proof of the absence of uranium in the zirconium matrix. Micrographs. (M27, U, Zr)

**255-M. Some Aspects of the Metallography of Stainless Steel and Stainless Steel Weldments.** G. V. Smith. *Welding Journal,* v. 35, May 1956, p. 456-462.

Differentiation of the several microconstituents of stainless steels can generally be accomplished with certainty, provided that several etchants are used in turn. Graphs, micrographs, photograph, tables, diagrams. 13 ref. (M27, SS)

**256-M.** (English.) **The Electronic Structures Around Impurities in Monovalent Metals.** Shozo Shinohara. *Hokkaido University, Faculty of Science, Journal,* ser. 2, v. 4, Dec. 1955, p. 337-390.

Behavior of electrons in binary alloys which form solid solutions, heat of formation of alloys in disordered state, heat of solution of hydrogen in copper, work functions of alloys. Diagrams, graphs, tables. 11 ref. (M25, P12, P15)

**257-M.** (French.) **Application of the Cathodic Oscillograph to the Recording of Temperature-Time Curves During Quick-Hardening of Metals.** Roland Bigot and René Faivre. *Revue de Métallurgie,* v. 53, no. 2, Feb. 1956, p. 131-138.

Apparatus used to study quantitatively the cooling kinetics of a nickel cylinder during its hardening and to show the importance and the diversity of calefaction phenomena in liquids decomposable or not by heat. Graphs, diagrams. 20 ref. (M23, N general, Ni)

**258-M.** (French.) **A Metallographic Study of Cold Working on Heat Resisting 80-20 Nickel-Chromium Alloys.** Ch. Bückle and J. Poulignier. *Revue de Métallurgie,* v. 53, no. 3, Mar. 1956, p. 179-188.

Metallurgical results of the alloy's use at high temperature. Superficial alterations due to skin-annealing treatment. Micrographs. 4 ref. (M27, Q24, Ni)

**259-M.** (Russian.) **Casting Titanium Film Replicas for Electron-Microscopic Examination of the Structure of Welded Joints.** Iu. B. Malevskii and G. F. Darovskii. *Avtomaticheskaia Svarka,* v. 9, no. 2, Mar.-Apr. 1956, p. 22-26.

A new method of separating film replicas from the specimen which provides clean films free of adherent particles. Discusses the use of 99.6 % pure titanium films for casting replicas of the surface of welded joints. Micrographs, diagram, diffractograms. 7 ref. (M21, Ti)

**260-M.** (Russian.) **Study of the Aluminum-Tantalum Phase Diagram.** V. M. Glazov, M. V. Mal'tsev and Iu. D. Chistiakov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 4, Apr. 1956, p. 131-136.

Thermal, chemical and X-ray analyses. Macro and microstructure of alloys. Relation of solubility of tantalum in aluminum to temperature. Peritectic reaction at 668-669° C. Tables, graphs, micrographs, phase diagrams. 2 ref. (M24, Al, Ta)

**261-M.** (Spanish.) **The Atomic Structure of the Actinides.** German E. Villar. *Ciencia y Tecnologia,* v. 5, no. 19, Oct.-Dec. 1955, p. 174-179.

Electronic configuration of the actinides and the law of formation of electronic configurations according to the most recent information. Tables. 12 ref. (M25, EG-h)

# N

## Transformations and Resulting Structures

**235-N. Sub-Surface Blowholes in Gray Irons and Their Association With Manganese Sulphide Segregation.** W. G. Tonks. *American Foundrymen's Society, Preprint No.* 56-23, 1956, 13 p.

Typical examples of the occurrence of sub-surface blowhole defects; experimental work designed to determine and investigate the cause of the trouble. Diagrams, graphs, micrographs, photographs, tables. 6 ref. (N12, CI)

**236-N. Effects of Fast Neutron Irradiation on Order-Disorder in Nickel-Manganese Alloys.** L. R. Aronin. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission),* MIT-1107, Apr. 1953, 60 p.

Effects of irradiation in a Hanford reactor on a series of alloys ranging from 16.5 to 31.9 at. % manganese were studied by resistivity and magnetic induction measurements. Diagram, tables, graphs. 26 ref. (N10, P15, P16, Ni, Mn)

**237-N. Self-Diffusion in Germanium.** Harry Letaw, Jr., William M. Portnoy and Lawrence Slifkin. *Physical Review,* v. 102, ser. 2, May 1, 1956, p. 636-639.

An accurate determination of the self-diffusion coefficient was obtained. In the temperature range from 766 to 928° C., it is represented by $D = 7.8 \exp(-68\,500/RT)$ cm$^2$ sec. Graphs, table. 15 ref. (N1, Ge)

**238-N. Remarks on the Granulation of Cast Iron.** E. M. Onitsch-Modl and R. Mitsche. *Powder Metallurgy Bulletin,* v. 7, Apr. 1956, p. 134-137.

Observations made during the preparation of cast iron granules. Results refer exclusively to cast iron melts obtained in the customary manner in the cupola furnace. Diagram, photographs. (N12, CI)

**239-N.** (Czech.) **To the Question of Stabilizing Titanium Stabilized Corrosion Resistant Cast 18 Cr, 9 Ni Steels.** Rudolf Pospisil and Rudolf Stefec. *Hutnické Listy,* v. 11, no. 4, Apr. 1956, p. 218-225.

Effect of titanium upon stabilization of 18% Cr, 9% Ni steel against intercrystalline corrosion is dealt with, keeping in mind that the carbides in cast steel show a different structural distribution than in laminated steel and considering also experiences with welds having the structure of cast steel. Tables, diagram, micrographs. 18 ref. (N8, R2, SS)

**240-N.** (Japanese.) **Some Observations on Grain Growth Characteristics of Austenite.** Taiji Kawai and Yoshiaki Masuko. *Iron and Steel Institute of Japan, Journal,* v. 41, no. 4, Apr. 1956, p. 435-442.

Change of grain size and growth characteristics during melting and teeming practice; relation between grain size and growth characteristics of a ladle sample and a finished product of the same heat; dependence of characteristics upon the degree of duplication of grains. Tables, graphs. 16 ref. (N3, N12, ST)

**241-N.** (German.) **Recrystallization Process in Copper Wire.** Otto Nielsen. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 9, no. 4, Apr. 1956, p. 151-158.

Investigation of the effect of inclusions on copper softness. Testing methods, effect of method of production, drawing rate and inclusions. Tables, graphs, diagram, photographs, micrographs. 6 ref. (N5, Cu)

**242-N.** (Japanese.) **Studies on the Decarburizing Reaction of Molten Fe-C Alloys. III. On the Concentration Dependence of the Specific Rate Constant of the Decarburizing Reaction.** Yoshinobu Katsufuji and Kichizo Niwa. *Iron and Steel Institute of Japan, Journal,* v. 41, no. 4, Apr. 1956, p. 412-416.

Relation between specific rate constant and concentrations of carbon and oxygen in the reactants. Graphs, table. 5 ref. (N14, Fe)

**243-N.** (Russian.) **On Quasi-Eutectic and Quasi-Eutectoid Structures.** Ia. V. Grechnyi. *Izvestiia Akademii Nauk SSSR, Otdelenie Teknicheskikh Nauk,* no. 3, Mar. 1956, p. 77-91.

Significance of quasi-eutectic areas on a crystallization diagram plotted on the basis of determination of limits of metastability in liquids and of conditions of metastable equilibrium. Graphs. 10 ref. (N12)

**244-N.** (Russian.) **Analytical Solutions of Simpler Problems of the Solidification of Different-Shaped Casting.** N. G. Girshovich and Iu. A. Nekhendzi. *Liteinoe Proizvodstvo,* no. 4, Apr. 1956, p. 13-17.

Equations for the solidification of cylindrical and spherical castings. Heat conductance and other factors. Graphs. (To be continued). (N12, E25)

**245-N.** (Spanish.) **Influence of Vanadium on the Susceptibility to Austenitic Grain Growth.** Justo Ferrer Flotats. *Instituto del Hierro y del Acero,* v. 9, no. 44, Mar. 1956, p. 267-274, disc., p. 275-276.

Experimental determination of the law of austenitic grain growth in new steels of different origins, with and without addition of vanadium. Graphs, table, micrographs. 10 ref. (N3, V, ST)

**246-N. Preparation of Alpha Uranium Single Crystals. II. Strain-Anneal Method.** E. S. Fisher. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5160 Aug. 1954, 75 p.

Failure to produce single crystals is attributed to strain-relieving mechanisms other than growth of recrystallization nuclei and to inhibition of growth of recrystallization nuclei by high concentrations of dispersed particles. Tables, micrographs, photographs, graphs. 10 ref. (N12, N5, U)

**247-N. Isothermal Transformation Diagram for a Silicon-Chromium Steel.** C. J. Osborn. *Australasian Engineer,* Feb. 1956, p. 63-64.

Preparation and use of diagram for type SAE 9254 steel. Graph. 5 ref. (N8, AY)

**248-N. Single Crystals of Exceptional Perfection and Uniformity by Zone Leveling.** D. C. Bennett and B. Sawyer. *Bell System Technical Journal,* v. 35, May 1956, p. 637-660.

The zone-leveling process was developed into a simple and effective tool, capable of growing large single crystals having high lattice perfection and containing an essentially uniform distribution of one or more desired impurities. Experimental work with germanium. Graphs, photographs, diagrams, tables. 17 ref. (N12, Ge)

**249-N. Kinetics of Solidification.** K. A. Jackson and Bruce Chalmers. *Canadian Journal of Physics,* v. 34, May 1956, p. 473-490.

The kinetic theory of melting and freezing is developed from consideration of atom movements at an interface between solid and liquid. Diagram, tables, graphs. 11 ref. (N12)

**250-N. Austenitic Manganese Steel. Effect of Heat Treatment on Metallography and Mechanical Properties.** K. J. Irvine and F. B. Pickering. *Iron & Steel,* v. 29, Apr. 1956, p. 135-139.

Quantitative metallographic study of the transformation characteristics for heating times up to 24 hr. Table, micrographs, graphs. (To be concluded.) (N8, AY)

**251-N. Diffusion of Donor and Acceptor Elements in Silicon.** C. S. Fuller and J. A. Ditzenberger. *Journal of Applied Physics,* v. 27, May 1956, p. 544-553.

Method based on change in conductivity through the penetration layer used to measure diffusion of boron and phosphorous; *p-n* junction method was used for other elements of Groups III and V. Photographs, tables, diagrams, graphs. 19 ref. (N1, Si)

**252-N. Theory of Order-Disorder Kinetics.** George H. Vineyard. *Physical Review,* v. 102, ser. 2, May 15, 1956, p. 981-992.

Problem of relating fundamental atom movements to the change of the state of order of an alloy is attacked in a basic manner by introducing an infinite array of distribution functions for the occupation of all possible sets of lattice sites. Graphs. 24 ref. (N10)

**253-N.** (English.) **An Isothermal Anneal Study of Quenched and Cold-Worked Copper-Palladium Alloys.** F. E. Jaumot, Jr., and A. Sawatzky. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 118-126.

Ordering probably takes place by a nucleation and growth process. Growth of ordered domains is a singly activated process with activation energies in the range from 34 to 46 kcal per mol., depending on composition and condition of the sample. Tables, graphs. 7 ref. (N10, N2, Pd, Cu)

**254-N.** (English.) **Order-Disorder and Cold-Work Phenomena in Cu-Pd Alloys.** F. E. Jaumot, Jr., and A. Sawatzky. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 127-144.

When disordered copper-palladium alloys are cold worked at room temperature, electrical resistivity decreases, magnetic susceptibility increases, temperature coefficient of resistivity decreases and the thermoelectric power becomes increasingly negative. Table, graphs. 18 ref. (N10, Cu, Pd)

**255-N.** (English.) **Cementite Morphology in Pearlite.** F. C. Frank and K. E. Puttick. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 206-210.

Characteristic growth patterns of cementite in pearlite, revealed by electron microscopy, discussed in terms of the geometry of growth and of diffusion and surface energy factors. Micrographs, diagrams. 2 ref. (N8, ST)

**256-N.** (English.) **On the Coarsening of Non-Sag Tungsten Lamp Filament Wires.** Sunao Ogni. *Physical Society of Japan, Journal,* v. 11, no. 5, May 1956, p. 593-598.

To make clear the nonsag nature of tungsten lamp filament, its recrystallization behavior was studied by means of microscopy and X-ray diffraction. Photographs, graph, micrographs, diffractograms. 9 ref. (N5, W)

**257-N.** (Czech.) **Contribution to the Mechanism of the Effect of Alloying Elements Upon the Eutectoid Reaction.** N. T. Gudcov and Josef Cadek. *Hutnické Listy,* v. 11, no. 4, Apr. 1956, p. 199-207.

Shows that the formation of cementite-containing pearlite is organically connected with segregation of tungsten in austenite. The cementite need not necessarily be an active nucleus of the eutectoid reaction even in cases where it forms (together with tungsten carbide) one of the stable carbide phases of a given steel. Tables, graph, diagrams. 5 ref. (N8, AY)

**258-N.** (German.) **Observations of Graphite Formation in Hypo-Eutectic Cast Iron.** Adalbert Wittmoser and Eduard Houdremont. *Archiv für das Eisenhüttenwesen,* v. 27, no. 4, Apr. 1956, p. 241-257.

Structural investigation of chilled untreated or magnesium hypoeutectic treated cast iron in the temperature range of 1350 to 1100° C. Table, graphs, diagrams, micrographs, photographs. 57 ref. (N8, CI)

**259-N.** (German.) **Time Regularities of Eutectoid Transformation.** Bernhard Ilschner. *Archiv für das Eisenhüttenwesen,* v. 27, no. 4, Apr. 1956, p. 275-280.

Hypothesis of lamination order and nucleus formation. Fundamentals of uncontrolled and hindered growth. Calculation of ratio regularities. Graphs, diagrams, micrograph. 14 ref. (N8)

**260-N.** (German.) **Contribution to the Study of the Iron-Nitrogen System.** Wolfgang Pitsch and Eduard Houdremont. *Archiv für das Eisenhüttenwesen,* v. 27, no. 4, Apr. 1956, p. 281-284.

Nitriding of carbonyl iron in an ammonia-hydrogen mixture. Determination of nitrogen in ferrite, by means of microhardness measurements. Calculation of diffusion values. Table, graphs, diagram, micrograph. 10 ref. (N1, Q29, J28, Fe)

**261-N.** (German.) **Relation Between $CuAl_2$ Structure and Separation Lattice of Aluminum-Copper Alloys.** Ulrich Dehlinger and Hans Pfleiderer. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 229-231.

The *O*-structure of $CuAl_2$ meets theoretical requirements. Diagram. 12 ref. (N9, Al, Cu)

**262-N.** (Italian.) **Separation From Supersaturated Mixed Crystals.** F. Bollenrath. *Metallurgia Italiana,* v. 48, no. 4, Apr. 1956, p. 141-152; disc., p. 152.

Isothermal evolution, with time, of the separation of supersaturated mixed crystals in some cast irons, steels and aluminum alloys. Aging curves examined as far as they follow the time law proposed by Wert and Zener; other aspects are explored. Tables, graphs, micrographs. 13 ref. (N7, AY, CI, Al)

**263-N.** (Japanese.) **Study of Heat-Resisting Steels—VII.** Eiichiro Asano. *Iron & Steel Institute of Japan, Journal,* v. 41, no. 5, May 1955, p. 524-531.

Influence of temperature and time on age hardening during solution treatment. All samples, solution-treated under different conditions, were aged at 800° C. (1470° F.) and hardness was measured from 1 to 200 hr. Graphs, photographs, table. 7 ref. (N7, J27, ST)

**264-N. A Discussion of the Phase Composition of Ball Bearing Steel and Its Measurement.** Donald P. Koistinen. *General Motors Engineering Journal,* v. 3, May-June 1956, p. 10-13.

Research studies provide new empirical formula, derived from quantitative X-ray diffraction data, for calculating retained austenite. Graphs, table, micrograph. 6 ref. (N8, ST)

**265-N. Austenitic Manganese Steel. Effect of Heat Treatment on Metallography and Mechanical Properties.** K. J. Irvine and F. B. Pickering. *Iron and Steel,* v. 29, May 1956, p. 169-170.

Tensile properties and work hardening characteristics. Micrograph, graphs. 6 ref. (N8, Q23, J26, AY)

**266-N. The Effect of Gravity in the Solidification of Steel.** B. Gray. *Iron and Steel Institute, Journal,* v. 182, Apr. 1956, p. 366-374.

Macrostructures obtained in a series of vertically cast, bottom-poured steel ingots with different feeding arrangements. Table, diagrams, photographs. 12 ref. (N12, M28, D9, ST)

**267-N. Thermodynamics of Carbon Dissolved in Iron Alloys. V. Solubility of Graphite in Iron-Manganese, Iron-Cobalt, and Iron-Nickel Melts.** E. T. Turkdogan, R. A. Hancock, S. I. Herlitz and J. Dentan. *Iron and Steel Institute, Journal,* v. 183, May 1956, p. 69-72.

Manganese increases graphite solubility in iron while cobalt and nickel decrease it. Graphs, tables. 17 ref. (N12, P12, Fe, Co, Ni)

**268-N. A Reconciliation of Certain Recovery Properties in Metals.** A. J. Kennedy. *Journal of the Mechanics and Physics of Solids,* v. 4, May 1956, p. 162-166.

A variety of time and temperature functions proposed to express the mechanical and electrical properties of metals can be reconciled with the behavior of a particular kind of physical model built up from relaxation-type elements. Graph. 18 ref. (N4)

**269-N. The Strain-Age Hardening of Mild Steel.** B. B. Hundy. *Metallurgia,* v. 53, no. 319, May 1956, p. 203-211.

Effects of strain aging on mechanical properties; a modification of the dislocation theory of strain aging to cover the change in strength and ductility during aging. Table, micrographs, graphs. 40 ref. (N7, CN)

**270-N.** (Czech.) **Contribution to the Study of Austenite Transformations During Slow Cooling.** Bohdan Sestak. *Hutnické Listy,* v. 11, no. 5, May 1956, p. 299-307.

Dilatometric method for determination of austenite transformation diagram during continuous cooling. A new specimen mounting enables

quenching at any moment during the test. Tables, graphs, diagrams, photographs, micrographs. 13 ref. (N8, M23, ST)

**271-N.** (French.) **Dilatometric Study of Specimens of Cast Iron Intended for the Fabrication of Enameled Pieces.** Pierre Détrez. *Fonderie*, no. 123, Apr. 1956, p. 151-156.

Investigates graphitic effect of silicon, the antigraphitic effect of manganese and the effect of these two elements on variations of the transformation point of cast iron. Tables, graphs. 4 ref. (N8, L27, CI)

**272-N.** (French.) **The Aging of Steel.** George D'Huart. *Metallurgie*, v. 88, no. 4, Apr. 1956, p. 339, 341, 343, 345.

Changes in mechanical properties of steel as a result of hardening, measured by tensile, hardness and impact tests. Aging by quenching and by deformation. Graphs, photographs. 1 ref. (N7, Q general, ST)

**273-N.** (French.) **Heterogeneities of a Beta-Brass Containing Aluminum (Study by X-ray Diffraction).** A. R. Weill. *Revue de Métallurgie*, v. 53, no. 2, Feb. 1956, p. 111-121.

Two factors contribute to great brittleness; presence of $\gamma$ phase, which persists even after quenching from 800° C. upwards, and a very heterogeneous polygonization which exists more particularly in quenched samples. Micrographs, tables, diffractograms. 18 ref. (N6, Q23, Cu)

**274-N.** (French.) **Contribution to the Study of Carbon and Nitrogen Diffusion in Alpha-Iron, by Internal Damping Measurement.** L. Guillet and B. Hocheid. *Revue de Métallurgie*, v. 53, no. 2, Feb. 1956, p. 122-130.

Measurements allow determination of activation heat involved during diffusion. For annealed, cold worked and aged probes, carbon and nitrogen cannot be lower than $6.10^{-4}$%. Diagrams, graphs. 19 ref. (N1, Q8, P12, Fe)

**275-N.** (French.) **Migration of Grain Boundaries During Creep. Mechanism of Migration.** D. McLean. *Revue de Métallurgie*, v. 53, no. 2, Feb. 1956, p. 139-146.

Speeds of sliding and migration vary differently with change in temperature. Migration of grain boundaries involves diffusion along the grains. Table, diagrams, graphs. 26 ref. (N3, Q3)

**276-N.** (French.) **Transformation of Iron-Chromium Alloys Near the Equiatomic Composition.** Gilles Pomey and Paul Bastien. *Revue de Métallurgie*, v. 53, no. 2, Feb. 1956, p. 147-159; disc., p. 160.

Two types of transformation; influence of order formation on physical properties. Table, graphs, micrographs. 23 ref. (N8, Fe, Cr)

**277-N.** (French.) **A Test for the Determination of Metallographic and Ionic Characteristics of Pearlitic Gray Iron, Through Anodic Oxidation.** André Roos. *Revue de Métallurgie*, v. 53, no. 3, Mar. 1956, p. 170-178.

Determination of diffusion coefficients for various alloys, variation of diffusion coefficients. Photographs, micrographs, tables, graphs, diagrams. 7 ref. (N1, L19, CI)

**278-N.** (French.) **A Study of Aluminum-Magnesium Alloys.** A. Saulnier. *Revue de Métallurgie*, v. 53, no. 4, Apr. 1956, p. 285-296; disc., p. 296-297.

Effects of quenching, hardening and silicon on structure. Graph, tables, micrographs, diffractogram. 9 ref. (N7, J26, Al, Mg)

**279-N.** (French.) **A Contribution to the Study on Purification of Iron and Determination of Its Transformation Points.** Christian J. Boulanger. *Revue de Métallurgie*, v. 53, no. 4, Apr. 1956, p. 311-319.

Certain treatments in hydrogen or vacuo, between 1400 and 1500° C., enable removal of most metalloid impurities and complete elimination of inclusions. Micrographs, diagrams. 23 ref. (N6, Fe)

**280-N.** (Russian.) **Carbide Phases Formed During Tempering of Hardened Steel.** B. A. Apaev. *Doklady Akademii Nauk SSSR*, v. 107, no. 5, Apr. 1956, p. 685-688.

Study of the low-temperature modification of the $Fe_xC$ carbide in tempered steel. Discusses the phase composition of steel tempered at various temperatures with respect to the three basic carbide phases. Graphs. 19 ref. (N8, J29, ST)

# P

## Physical Properties and Test Methods

**266-P. Service Life of Iron Castings Can Be Affected by Their Thermal Conductivity.** J. A. Davis, H. W. Deem and H. W. Lownie, Jr. *American Foundrymen's Society, Preprint No.* 56-26, 1956, 3 p.

Quantitative data on the coefficient of thermal conductivity of five irons between 150 and 600° F. Four service conditions which make thermal conductivity an important factor in design and service life. Graph, micrographs, table. (P11, S21, CI)

**267-P. Measuring the Thermal Diffusivity of Metals at Elevated Temperatures.** M. A. El-Hifni and B. T. Chao. *ASME, Transactions*, v. 78, May, 1956, p. 813-819; disc., p. 820-821.

Apparatus employs a "steady" sinusoidal heat flow in which due account is taken of the influence of small heat loss at the surface of a thin-walled tubular specimen. Table, diagrams, graphs, photograph. 13 ref. (P11)

**268-P. The Penetration Depth in Impure Super-Conducting Tin.** R. G. Chambers. *Cambridge Philosophical Society, Proceedings*, v. 52, Apr. 1956, p. 363-375.

A new method for measuring the surface impedance of metals at low temperatures and at radiofrequencies. Graphs, tables. 18 ref. (P15, Sn)

**269-P. Hydrogen Overpotential on Aluminum.** D. J. Hansen and F. E. W. Wetmore. *Canadian Journal of Chemistry*, v. 34, May 1956, p. 659-664.

Hydrogen overpotential of pure and impure aluminum in 0.1 $N$ $H_2SO_4$ at 25° C.; effect of autocorrosion; role of impurities in determining the overpotential and the rest potential. Graphs, tables. 8 ref. (P15, Al)

**270-P. Determination of the Activity of Sodium in Sodium-Lead Alloys at High Temperatures.** Bernard Porter and Morris Feinleib. *Electrochemical Society, Journal*, v. 103, May 1956, p. 300-303.

The e.m.f. of cells (Na (pure)/ $Na^+$/Na in Pb) was directly measured up to 820° C, using alumina containers impregnated with sodium carbonate in an argon atmosphere. Results were converted to activities and extrapolated to 1010° C. Diagrams, graphs, tables. 2 ref. (P12, Pb, Na)

**271-P. Low Temperature Thermal Expansion of Various Materials.** Henry L. Laquer. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, AECD-3706, Dec. 1952, 58 p.

Expansion of 15 metals and miscellaneous substances measured; literature data for other materials were collected. Diagram, tables, graphs. 71 ref. (P11)

**272-P. Photoconductivity in Manganese-Doped Germanium.** R. Newman, H. H. Woodbury and W. W. Tyler. *Physical Review*, v. 102, ser. 2, May 1, 1956, p. 613-617.

Impurity photoconduction observed in $n$- and $p$-type manganese-doped germanium at low temperatures. The spectra are consistent with the published ionization energy values determined from conductivity data. Graphs. 14 ref. (P15)

**273-P. Scattering of Carriers From Doubly Charged Impurity Sites in Germanium.** W. W. Tyler and H. H. Woodbury. *Physical Review*, v. 102, ser. 2, May 1, 1956, p. 647-655.

The effect of doubly charged impurity sites on the mobility of carriers was observed in both equilibrium and photoconductivity measurements. Graphs. 20 ref. (P15, Ge)

**274-P. Atomic Heats of Normal and Superconducting Vanadium.** W. S. Corak, B. B. Goodman, C. B. Satterthwaite and A. Wexler. *Physical Review*, v. 102, ser. 2, May 1, 1956, p. 656-661.

Atomic heats of vanadium determined from just above the transition temperature, $T_c = 5.03°$ K., down to 1.1° K. Graphs, tables. 19 ref. (P12, V)

**275-P. Atomic Heats of Normal and Superconducting Tin Between 1.2° and 4.5° K.** W. S. Corak and C. B. Satterthwaite. *Physical Review*, v. 102, ser. 2, May 1, 1956, p. 662-666.

Atomic heat measurements on tin in the normal and superconducting states revealed that the electronic contribution to the atomic heat in the superconducting state, $C_{es}$, could be represented below about 0.7 $T_c$ by the same exponential expression found applicable to vanadium. Graphs, tables. 11 ref. (P12, Sn)

**276-P. Resistivity of Interstitial Atoms and Vacancies in Copper.** A. W. Overhauser and R. L. Gorman. *Physical Review*, v. 102, ser. 2, May 1, 1956, p. 676-681.

Residual resistivity associated with the presence of interstitial atoms or vacancies in copper is studied with particular attention devoted to the scattering of conduction electrons resulting from lattice distortions surrounding the imperfections. Tables. 12 ref. (P15, M26, Cu)

**277-P. Effects of Gamma Radiation on Germanium.** J. W. Cleland, J. H. Crawford, Jr., and D. K. Holmes. *Physical Review*, v. 102, ser. 2, May 1, 1956, p. 722-724.

Studies of the effect of gamma radiation on the electrical properties of germanium, chosen because of its very great sensitivity to fast-particle bombardment. Graph. 15 ref. (P15, Ge)

**278-P. Investigation of Sintered Metals by Means of Over-Voltage Measurements.** E. Cremer and P. Hittmair. *Powder Metallurgy Bulletin*, v. 7, Apr. 1956, p. 82-87.

The para-hydrogen transformation was used as a test reaction. Effects of sintering temperature and compacting pressure of compacts prepared from carbonyl nickel and carbonyl cobalt powders investigated. Diagram, graph, micrographs, table. 5 ref. (P15, H14, H15)

**279-P. Thermal Expansion of Zirconium and Zirconium-Tin Alloys Up to 570° C.** Marvin Moskowitz and L. W. Kates. *Sylvania Electric Products, Inc., Metallurgical Laboratory (U. S. Atomic Energy Commission),* SEP-91, June 1952, 12 p.

Data obtained from thermal linear expansion measurements were used to derive separate second degree equations for each specimen, relating length and temperature. Graphs, micrographs, table. 1 ref. (P11, Sn, Zr)

**280-P.** (English). **Statistical Mechanics of Irreversible Processes. VI. Thermal Conductivity of Crystals.** R. Brout and I. Prigogine. *Physica,* v. 22, no. 4, Apr. 1956, p. 263-272.

A molecular theory of thermal conductivity is obtained. 7 ref. (P11)

**281-P.** (German.) **Hall Effect and Electrical Resistance of In-Sb in Strong Magnetic Fields and High Pressure.** Johannes Gielessen and Kurt Hans V. Klitzing. *Zeitschrift für Physik,* v. 145, no. 2, 1956, p. 151-155.

Measurements under increasing pressures up to 7400 kg. per. sq.cm. and under magnetic field up to $\mu_0 = 1.4$ Wb/m². Graphs, diagrams. 3 ref. (P15, P16, In, Sb)

**282-P.** (Japanese.) **Interfacial Tension Between Molten Iron and Slags.** Kazumi Moir and Tadato Fujimura. *Iron & Steel Institute of Japan, Journal,* v. 41, no. 5, May 1955, p. 495-500.

Method for determining the interfacial tension between molten iron and slag consists of photographing the sessile drop of the molten iron by X-ray, measuring the dimensions of the drop by means of a microcomparater, and calculating the interfacial tension using the Bashforth-Adams table. Diagrams, graphs, tables, 19 ref. (P10, B21, Fe)

**283-P.** (Russian.) **Interrelation Between the Anisotropy of the Hall Effect and the Variation in the Resistance of Metals in a Magnetic Field. I. Investigation of Zinc.** E. S. Borovik. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* v. 30, no. 2, Feb. 1956, p. 262-271.

Relation of resistance and the Hall field for zinc to the magnitude of the angle between the axis of symmetry of the sixth order and the magnetic field in fields of up to 25,000 oersteds at temperatures of 4 and 20° C. Theoretical explanation of regularities observed. Graphs. 21 ref. (P15, Zn)

**284-P.** (Russian.) **Comparison of Physical-Chemical Properties of Carbides.** I. S. Gaev. *Zhurnal Neorganicheskoi Khimii,* v. 1, no. 2, Feb. 1956, p. 193-211.

Physical-chemical properties of carbides as such and carbides in steels. Tables, graphs. 53 ref. (P general, N8, ST, C-n)

**285-P.** (Russian.) **Enthalpy of Formation of Compounds of Zinc With Antimony.** S. A. Shchukarev, M. P. Morozova and Iu. P. Sapozhnikov. *Zhurnal Obshchei Khimii,* v. 26, no. 2, Feb. 1956, p. 304-307.

Possible reasons for abundance of thermodynamically stable forms in bimetallic systems as compared with systems of metal and nonmetal. 9 ref. (P12, Zn, Sb)

**286-P. Iron-Aluminum Alloys for Use in Magnetostrictive Transducers.** Miles T. Pigott. *Acoustical Society of America, Journal,* v. 28, May 1956, p. 343-346.

Electromechanical coupling coefficient determined for iron-aluminum alloys containing 12-14% aluminum and annealed at temperatures between 600 and 1100° C. Tables, graphs. 12 ref. (P16, Fe, Al)

**287-P. Change of the Absolute Thermoelectric Power and Electrical Resistivity of Copper by Cold-Working at Liquid Air and Room Temperature.** M. J. Druyvesteyn and D. J. van Ooijen. *Applied Scientific Research,* v. 5, sec. B, no. 6, 1956, p. 437-441.

Cold working at liquid air temperature affects the thermo-electric power and the resistivity more strongly than cold working at room temperature. Graphs. 3 ref. (P15, Cu)

**288-P. Thermoelectric Power of AuCu in Nonequilibrium States.** H. Cooper, P. Schwed and R. W. Webeler. *Journal of Applied Physics,* v. 27, May 1956, p. 516-518.

Measurements made of the variation of the resistivity and of the thermo-electric power during annealing at several temperatures of thermally disordered and of mechanically disordered samples of gold-copper alloys. Graphs. 4 ref. (P15, Au, Cu)

**289-P. The Distribution of Copper Between Germanium and Ternary Melts Saturated With Germanium.** C. D. Thurmond and R. A. Logan. *Journal of Physical Chemistry,* v. 60, May 1956, p. 591-595.

Solubility of copper in solid germanium measured as a function of the copper concentration in ternary germanium-copper-lead melts saturated with germanium at 700° C. Graphs. 19 ref. (P13, N12, Cu, Ge)

**290-P. The Magnetic Susceptibilities of Copper, Silver and Gold, and Errors in the Gouy Method.** W. G. Henry and J. L. Rogers. *Philosophical Magazine,* v. 1, 8th ser., no. 3, Mar. 1956, p. 223-236.

Direct determination is made of the absolute magnetic mass susceptibility, with consideration given to the correction for ferromagnetic impurities. The method of calibrating the field by a current-carrying loop and of making allowance for the variation of the field strength in the plane normal to the axis of the specimen given in detail. Graphs, tables, diagram. 16 ref. (P16, Cu, Ag, Au)

**291-P. The Magnetic Susceptibilities of Some Diamagnetic Alloys: The Primary Solid Solutions of Zinc, Gallium, Germanium and Arsenic in Copper.** W. G. Henry and J. L. Rogers. *Philosophical Magazine,* v. 1, 8th ser., no. 3, Mar. 1956, p. 237-252.

Rates of change of susceptibility, with concentration in the solid solution region of the four systems. Magnetic properties and alloy preparation. Tables, graphs, diagrams. 28 ref. (P16, Cu, Zn, Ga, Ge, As)

**292-P. Optical Absorption of Copper and Silver at 4.2° K.** Manfred A. Biondi. *Physical Review,* v. 102, ser. 2, May 15, 1956, p. 964-967.

Absorptivity measured as a function of wavelength over the visible and near-infrared regions. Table, diagrams, graphs. 15 ref. (P17, Ag, Cu)

**293-P. Paramagnetic Effect in Superconducting Tin, Indium, and Thallium.** James C. Thompson. *Physical Review,* v. 102, ser. 2, May 15, 1956, p. 1004-1008.

Measurements on the longitudinal magnetization of pure rods in the intermediate state between normal and superconduction. Diagram, graphs, table. 9 ref. (P16, P15, Tl, In, Sn)

**294-P. The Variation With Temperature of the Spectral Emissivities of Iron, Nickel and Cobalt.** L. Ward. *Physical Society, Proceedings,* v. 69, no. 435B, Mar. 1956, p. 339-343.

In iron and cobalt, a fairly abrupt change in emissivity occurs at temperatures near the Curie points. Graphs, tables, diagram. 8 ref. (P17, Co, Fe, Ni)

**295-P.** (English.) **Magnetic After-Effect in $Ni_3Mn$ Alloy.** Tadami Taoka. *Physical Soicety of Japan, Journal,* v. 11, no. 5, May 1956, p. 537-547.

After-effect is large at the intermediate state of order of the alloy, is most noticeable at the steepest part of the magnetization curve, is comparatively temperature insensitive, and is not affected by mechanical deformation. Micrographs, table, diagrams, graphs. 18 ref. (P16, Ni, Mn)

**296-P.** (English.) **Note on the Paramagnetic Susceptibility and the Gyromagnetic Ratio in Metals.** Ryogo Kubo and Yukio Obata. *Physical Society of Japan, Journal,* v. 11, no. 5, May 1956, p. 547-550.

Although the orbital magnetic moments of the electrons in metals are "quenched" by the crystal field, their contribution to the paramagnetic susceptibility for partly filled degenerate bands is shown to be of the same order of magnitude as the Pauli spin paramagnetism. Graph. 5 ref. (P16)

**297-P.** (English.) **Study of Magnetic Annealing of $Ni_3Fe$ Single Crystal.** Soshin Chikazumi. *Physical Society of Japan, Journal,* v. 11, no. 5, May 1956, p. 551-558.

Magnetic anistropy induced by magnetic annealing measured for $Ni_3Fe$ single crystal by means of a high-temperature torque magnetometer. Diagrams, table, graphs. 5 ref. (P16, Ni, Fe)

**298-P.** (English.) **On the Positions of the Equivalent Poles on a Magnetized Bar Tested by the Magnetometer Method. III. Electrolytic Iron and Mo-Cr Permalloy.** Hakaru Masumoto and Makoto Sugihara. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 5, Oct. 1955, p. 425-432.

The positions of equivalent poles of specimens are remarkably influenced by the relative position of the magnetized specimen and the magnetometer, the distance between them, the states of magnetization of specimens, and the type of material. Tables, graphs. 3 ref. (P16, Fe, Ni)

**299-P.** (English.) **Study on the Transformation of Zinc by Electric Resistance in Connection With Eutectic Phenomena.** Mitsuru Sato and Toshiro Suzuoka. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 5, Oct. 1955, p. 433-442.

Precise measurements of the electric resistance of pure zinc made at high temperatures; anomalous changes were observed at 170, 200, 230 and 320° C. Graphs, tables, diagrams. 28 ref. (P15, N11, Zn)

**300-P.** (English.) **Paramagnetism of Tin Observed at the Superconducting Transition.** Yushio Shibuya and Seiichi Tanuma. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 6, Dec. 1955, p. 549-567.

Measurements were made on tin cylinders in the presence of an external magnetic field and with an externally supplied current at the superconducting transition. It was

ascertained that the paramagnetic effect is not such an apparent one as once supposed, but an intrinsic one without hysteresis. Diagrams, graphs. 22 ref. (P16, N11, Sn)

**301-P.** (English.) **Attenuation of the Ultrasonic Waves in Metals. I. Aluminium.** Tokutaro Hirone and Kazuo Kamigaki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 5, Oct. 1955, p. 455-464.

Attenuation coefficients of longitudinal ultrasonic waves in aluminum measured by pulsed ultrasonic waves at frequencies ranging from 2 to 25 mc. per sec. Table, micrographs, graphs, diagrams, oscillograms. 9 ref. (P10, Al)

**302-P.** (English.) **Anomaly of Specific Heat in α-Phase Alloys of Copper and Aluminium.** Hakaru Masumoto, Hideo Saito and Minoru Takahashi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 5, Oct. 1955, p. 465-468.

Specific heats of 12 copper alloys containing less than 14.59% of aluminum measured at high temperatures at annealed and heat treated states by the inverse rate curve method. Tables, graphs. (P12, N10, Cu, Al)

**303-P.** (English.) **On the Activities of Si and C in Molten Fe-Si-C Alloys.** Masayasu Ohtani. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 5, Oct. 1955, p. 487-501.

An electrochemical study of alloys in the liquid phase; solubility change of graphite on the addition of silicon; effect of carbon upon the activity of each solute. Diagrams, graphs, tables, photograms. 19 ref. (P12, Si, Fe)

**304-P.** (English.) **Influence of Addition of Nickel on the Thermal Expansion, Rigidity Modulus and Its Temperature Coefficient of the Alloys of Cobalt, Iron, and Chromium, Especially of Co-Elinvar. II. Additions of 30 and 40% of Nickel.** Hakaru Masumoto, Hideo Saito and Yutaka Sugai. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 6, Dec. 1955, p. 533-540.

Studies at temperatures from 10 to 50° C. Tables, graphs. 3 ref. (P11, Q1, Cr, Co, Fe, Ni)

**305-P.** (English.) **Singularity in Pure Zinc at High Temperatures.** Toshiro Suzuoka and Tokihiro Kuroyanagi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 6, Dec. 1955, p. 541-548.

Measurements of electrical resistance at various temperatures and effects of quenching on specific gravity disclosed no anomalies in behavior from room temperature up to the melting point. Graphs, tables, diagram. 36 ref. (P15, P10, Zn)

**306-P.** (German.) **Conductivity Theory of Metals at Low Temperatures.** B. Mühlschlegel. *Annalen der Physik,* v. 17, no. 4-5, 1956, p. 199-213.

Metal electron transport in presence of electrical field and temperature gradients. Diagrams. 13 ref. (P15)

**307-P.** (German.) **Magnetic Powder Specimens of Cobalt at High Temperatures.** Wilfried Andrä. *Annalen der Physik,* v. 17, no. 4-5, 1956, p. 233-235.

Observation of magnetic changes in crystals of cobalt suspended in a mixture of iron oxide and paraffin. Micrographs. (P16, H11, Co)

**308-P.** (German.) **Theory of Sound Velocity in Metals.** Karl-Heinz Schramm. *Annalen der Physik,* v. 17, no. 4-5, 1956, p. 242-248.

Relationship between propagation velocity of small disturbances of the conducting electrons of a metal, and the ones of the ionic system. Derivation of a corresponding formula. Tables, diagram. 5 ref. (P10)

**309-P. An Analysis of the Available Data on the Total Heat of Commercial Steels.** J. R. Pattison. *Iron and Steel Institute, Journal,* v. 183, May 1956, p. 64-68.

Most reliable data relate to a 4% silicon steel. No other data for temperatures above 1300° C., for any steel, are yet available, and existing data for the range of temperatures up to 1300° C. are of unproven reliability. Tables, graph. 16 ref. (P12, ST)

**310-P. Anomalous Electron Emission From Metallic Surfaces.** Franz R. Brotzen. *Naval Research Laboratory, NRL Report* 4733, Apr. 1956, 10 pages.

Low-melting metals and alloys were heated in a Geiger-Muller free-flow tube and electron emission from their surfaces was observed. Graphs, diagram. 33 ref. (P15, SG-d)

**311-P. An Electrical Resistivity Study of Lattice Defects Introduced in Copper by 1.25 Mev Electron Irradiation at 80° K.** C. J. Meechan and J. A. Brinkman. *North American Aviation, Inc., Atomics International (U. S. Atomic Energy Commission),* NAA-SR-1571, Apr. 1956, 35 pages.

A recovery state centered near room temperature exhibited a phenomenological activation energy of 0.60 ± 0.01 e.v. and obeyed a second order chemical rate equation. Diagram, graphs, tables. 23 ref. (P13, P15, Cu)

**312-P. Simultaneous Measurements of Density, Viscosity, and Electric Conductivity of Melts.** J. D. Mackenzie. *Review of Scientific Instruments,* v. 27, May 1956, p. 297-299.

Apparatus for measurements at high temperatures. Vacuum fusion is possible in the same apparatus. Diagrams, graphs. 6 ref. (P10, P15)

**313-P. Thermal and Electrical Conductivities of the Alkali Metals at Low Temperatures.** D. K. C. MacDonald, G. K. White and S. B. Woods. *Royal Society, Proceedings,* v. 235, ser. A, May 8, 1956, p. 358-374.

Measurements were made on very pure lithium, sodium, potassium, rubidium and cesium down to temperatures at low as 2° K. Tables, graphs. 47 ref. (P11, P15, Cs, Rb, K, Na, Li)

**314-P.** (English.) **Effect of Manganese Content on the Thermal Expansion Coefficient and Magnetic Properties of the So-Called Dumet Iron-Nickel Alloys.** T. Millner and R. Welesz. *Acta Technica Academiae Scientiarum Hungaricae,* v. 14, no. 3-4, 1956, p. 279-291.

Great pains must be taken to keep the manganese content at a low level and to control the manganese content in the application of such alloys for leads in vacuum tubes. Diagram, graphs, tables. 6 ref. (P11, P16, T1, Fe, Ni)

**315-P.** (French.) **Measurement of Electrolysis.** R. Piontelli, G. Montanelli and G. Sternheim. *Revue de Métallurgie,* v. 53, no. 4, Apr. 1956, p. 248-254; disc., p. 254.

General information and practical examples of methods used in presence of melted salt baths. Diagrams, graphs. 9 ref. (P15)

**316-P.** (German.) **Determination of Softening Temperature in Quality Control of Oxygen-Containing Copper Rod.** Sven Lundquist and Sölve Carlén. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 9, no. 4, Apr. 1956, p. 145-151.

Softening temperature as an indicator of various technological properties. Tables, graphs, photographs. 4 ref. (P12, Cu)

**317-P.** (Russian.) **Density and Surface Tension of Liquid Technical Titanium.** V. P. Eliutin and M. Maurakh. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnisheckikh Nauk,* no. 4, Apr. 1956, p. 129-131.

Methods of coping with difficulties ( high melting temperature and increased chemical activity) of determining surface tension of high-melting metals. Diagrams, table. 6 ref. (P10, Ti)

**318-P.** (Russian.) **Temperature Dependence of the Magnetostriction of Ferromagnetic Alloys.** D. I. Volkov, V. I. Chechernikov and V. B. Tseitlin. *Moskovskogo Universiteta, Vestnik, Seriia Fiziko-Matematicheskikh i Estestvennykh Nauk,* v. 11, no. 2, Feb. 1956, p. 21-28.

A study of the temperature dependence of the magnetostriction of saturation of ferromagnetic alloys of nickel with copper, manganese, iron and cobalt. Results corroborate the theoretically found linear law of change of magnetostriction with temperature in the vicinity of the Curie point. Graphs. 15 ref. (P16, Ni, Cu, Mn, Fe, Co)

# Q

## Mechanical Properties and Test Methods; Deformation

**470-Q. Effects of Section Size Variations in a Test Casting on Properties of Some Mg-Al-Zn Alloys.** W. E. Pearson. *American Foundrymen's Society, Preprint No.* 56-63, 1956, 9 p.

Alloys studied in the T4 condition include a series of 16 containing 5 to 9% Al, 0.0 to 1.0% Zn and 0.2% Mn. Slope casting is shown to be useful in alloy development, heat treatability, grain size and porosity tendency studies. Diagram, graphs, photograph, tables. 17 ref. (Q general, E general, Mg)

**471-Q. Hot Tearing Characteristics of Acid and Basic Steel Castings Determined by High Temperature Testing.** C. F. Christopher. *American Foundrymen's Society, Preprint No.* 56-171, 1956, 15 p.

Study of the high-temperature dynamic properties of a series of steels varying in chemical composition and methods of manufacture. Graphs, micrographs, photographs, tables. (Q23, CI)

**472-Q. The Application of a New Structural Index to Compare Titanium Alloys With Other Materials in Airframe Structures.** L. R. Jackson and S. A. Gordon. *American Society of Mechanical Engineers, Paper No.* 56-AV-10, 1956, 17 p.

Data on simple structural elements made from titanium alloys may not only be used to weld the behavior of alloy components to the background of experience on conventional materials but also to make the first steps toward the prediction of behavior that might be expected at high temperatures. Diagrams, graphs, tables. (Q general, T24, Ti)

**473-Q. On the Relations Between Various Laboratory Fracture Tests.** E. M. Lape and J. D. Lubahn. *ASME, Transactions,* v. 78, May, 1956, p. 823-833; disc., p. 833-835.

Notched and unnotched tensile tests, notched and unnotched bend tests, notched and unnotched disk-bursting tests and Charpy impact tests examined with the objective of finding correlations. Diagrams, photographs, graphs, tables. 18 ref. (Q26)

**474-Q. The Tensile Properties of Uranium in the Inelastic Range of Stress.** Robert W. Lewis and Glenn Murphy. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-527, June 1954, 33 p.

Uranium was subjected to tensile tests in which the parameters of temperature, strain rate and load cycling are varied to determine the influence of each on the strain hardening properties. Tables, graphs. 16 ref. (Q27, U)

**475-Q. Development of Zirconium Alloys. I.** A. D. Schwope, L. L. Marsh and W. Chubb. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-79, Aug. 1951, 22 p.

Small additions of molybdenum, tantalum, tin, titanium and nitrogen appreciably increase the high-temperature tensile strength of zirconium. Graphs, tables. (Q27, Zr)

**476-Q. Notched-Bar Impact Testing of Uranium.** S. J. Paprocki and H. A. Saller. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-753, June 1952, 22 p.

Specimens possessing five different heat treatment histories were tested over the range from −100 to 300° F. Behavior was comparable with hot rolled Monel or Inconel. Photographs, table, graphs. 22 ref. (Q6, U)

**477-Q. Mechanical Properties of Ternary Zirconium Alloys.** A. D. Schwope and W. Chubb. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-818, Apr. 1953, 24 p.

Tensile properties, hot hardness, corrosion resistance and heat treating characteristics were investigated in the search for alloys having good high-temperature strength. Tables. (Q27, Q29, R general, J general, Zr)

**478-Q. Stress in Electrodeposited Coatings. Its Significance and Measurement. II.** Joseph B. Kushner. *Metal Finishing*, v. 54, May 1956, p. 58-63.

Effect of plating variables on stress excess energy theory, hydrogen theory, hydrate theory, methods for measuring stress. Graphs, photographs. 14 ref. (Q25)

**479-Q. A Nomograph for Strain Conversion.** F. Forscher. *Metal Progress*, v. 69, May 1956, p. 80-B, 96, 98.

Chart may be used to convert different ductility measurements without calculation. Graph. (Q23, Q27)

**480-Q. Prestressing an Ultra High-Strength Steel to Perform Even Higher Duty.** Jerome W. Kaufman. *Metal Progress*, v. 69, May 1956, p. 87-90.

A small ordnance forging made of high-strength steel which was failing in service was successfully replaced with another of identical design but made of an ultra high-strength steel heat treated to about 283,000 psi. tensile ultimate. Diagrams. (Q general, G23, AY)

**481-Q. Choice of High-Temperature Alloys. Influence of Fabrication History.** Nicholas J. Grant. *Metal Progress*, v. 69, May 1956, p. 81-86.

Most important is the crystalline condition and its stability. An alloy whose crystals can absorb the maximum amount of deformation (with resulting strengthening) and retain this without recrystallization to the highest temperature will probably have the highest rupture strengths. Graphs, tables. (Q general, N5, SG-h)

**482-Q. Creep of Vanadium-Bearing Steels.** (Digest of "The Effect of Vanadium Upon the Creep Strength of Low-Alloyed Steels for Tubes", by O. L. Bihet, Joint Metallurgical Societies Technical Session in Liege, Belgium, June 13, 1955, 13 p.) G. F. Comstock. *Metal Progress*, v. 69, May 1956, p. 141-142.

Testing of vanadium-bearing steels of varying composition, heat treating, properties. (Q3, AY)

**483-Q. Effect of Cyclotron Irradiation on Creep of Aluminum.** H. P. Yockey, M. R. Jeppson and R. D. Keen. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-121, June 1951, 30 p.

Irradiation with alpha particles of 38 m.e.v. yields data from which the plastic properties of aluminum in high-flux reactors may be predicted. Photographs, diagrams, table, graphs. 15 ref. (Q3, Al)

**484-Q. Hot Hardness of Some Binary Molybdenum Base Alloys.** Egon Pipitz. *Powder Metallurgy Bulletin*, v. 7, Apr. 1956, p. 146-148.

Experimental work on the hot hardness of the most important molybdenum alloys. Graphs. 3 ref. (Q29, Mo)

**485-Q. The Mechanics of Quasi-Static Plastic Deformation in Metals.** R. Hill, Paper from "Surveys in Mechanics". Cambridge University Press. p. 7-31.

Deformation of single crystals, plastic behavior of crystalline aggregates, continuum mechanics and the plastic-rigid model. Graphs, diagrams. 80 ref. (Q24)

**486-Q.** (German.) **Effect of Load Rate in Tensile Test on Construction of Stress-Strain Diagram.** F. Fischer. *Metall*, v. 10, nos. 9-10, May 1956, p. 419-423.

Discussions are limited to soft steels since there the phenomena are most significantly expressed. The same principles could be applied to nonferrous metals. Graphs. 28 ref. (Q27, CN)

**487-Q.** (Japanese.) **Study on the Hot Working Properties of Rimmed Steel. II.** Toshio Ikeshima and Tatsuaki Morishima. *Iron and Steel Institute of Japan, Journal*, v. 41, no. 4, Apr. 1956, p. 430-435.

The chemical compositions of black spots were analyzed and their microstructures examined. Hot working properties of steel containing the same amount of sulfur as that of the black spots were investigated by impact-bending and tensile tests at high temperatures. Graphs, photograph, micrographs, tables. 6 ref. (Q23, Q6, Q27, ST)

**488-Q. The Creep of Zirconium in Water From 400° to 600° F.** D. R. Brunstetter, N. P. Kling and B. H. Alexander. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission)*, SEP-54, Apr. 1951, 17 p.

Secondary creep, limiting creep stress and total elongation determined in 2000-hr. tests. Diagram, graphs, tables. 2 ref. (Q3, Zr)

**489-Q. Investigation of the Influence of Deoxidation and Chemical Composition on Notched-Bar Properties of Ship Plate Steels.** F. W. Boulger, R. H. Frazier and C. H. Lorig. *Welding Research Council Bulletin Series*, No. 26, Apr. 1956, 18 p.

Result of an investigation of some 400 heats of steel to determine the effects of variations in composition and deoxidation practice on the fracture characteristics of ship plate steel. Graphs, tables. 31 ref. (Q23, Q26, ST)

**490-Q.** (Russian.) **On Ways of Increasing the Static Strength of Welded Joints Working in Low-Temperature Conditions.** V. I. Novikov. *Avtomaticheskaia Svarka*, v. 9, no. 1, Jan.-Feb. 1956, p. 47-57.

Experiments investigating the influence of mechanical treatment of seams, of local heat treatment and of local cold hardening of welded joints on their static strength at low temperatures. Tables, diagrams, graphs, photograph. 15 ref. (Q23, K1, J general)

**491-Q.** (Japanese.) **Studies on the Hot-Working Strength of Steel. I. The High-Temperature-High Speed Tension Testing Machine.** Katsuro Inouye. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 5, May 1956, p. 506-515.

Design and construction of the testing machine, together with a suitable experimental technique. Both nominal stress-strain curve and true-stress natural strain curve in all deforming conditions of all types of steels are obtained. Diagrams, graphs, photograph, table. 11 ref. (Q27, ST)

**492-Q.** (Russian.) **Loss of Tensile Strength in Cast Steel.** O. V. Stupishina and V. I. Likhtman. *Doklady Akademii Nauk SSSR*, v. 107, no. 2, Mar. 11, 1956, p. 252-254.

Effect of micro and macroporosity of cast steels of different hardness on their strength and plasticity during tension. Yield point and other values. Relation between hardness, brittleness and strength. Table, graphs. (Q23, Q29, CI)

**493-Q.** (Russian.) **On the Correlation Between Indentation Hardness and Modulus of Normal Elasticity of Pure Metals at Higher Temperatures.** M. G. Lozinskii and S. G. Fedotov. *Izvestiia Akedemii Nauk, SSSR, Otdelenie Teknicheskikh Nauk*, no. 3, Mar. 1956, p. 59-67 + 2 plates.

Experimental data on hardness of several pure metals (platinum, palladium, rhodium, iridium, tungsten, molybdenum, titanium, zirconium, iron, nickel, cobalt, copper and silver) are construed to prove that the main part in the resistance to plastic deformation at higher temperatures is played by the strength of interatomic bonds, best characterized by the modulus of elasticity rather than by melting temperatures. Tables, graphs, micrographs. 10 ref. (Q21, Q29)

**494-Q.** (Russian.) **Temper Brittleness of Chromium-Nickel-Manganese Steel in Relation to Additional Alloying of the Steel.** M. P. Braun and E. E. Maistrenko. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1956, p. 28-33.

Effect of alloy additions of titanium, vanadium, tungsten, molybdenum and columbium to two groups of steel. Relation of impact toughness to tempering temperature and rate of cooling. Tables, graphs. 7 ref. (Q23, Q6, AY)

**495-Q.** (Russian.) **Hardness of Steel, Quench-Hardened After Induction Heating.** I. Ia. Gorbul'skii. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1956, p. 34-37.

Attempts to provide empirical formulas for calculating hardness of quench-hardened layer. Relation between quantity of carbon and hardness. Does not take into account the heating-time factor. Tables, graph. 8 ref. (Q29, J2, ST)

**496-Q.** (Russian.) **Wear Resistance of Quench-Hardened Steel Using the Usual Type of Heating and Induction Heating.** G. A. Preis. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 47-50.

Relation of microhardness of surface layer to tempering temperature. Comparative wear and friction tests (without lubrication or with poor lubrication). Graphs, diagram. 8 ref. (Q9, J26, Q29, J2, ST)

**497-Q.** (Russian.) **Mechanical Properties of Steel EI579 After Prolonged Heating at 550 and 700°.** E. I. Uriupina. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 52-55.

Effect of tempering and quench-hardening procedures and temperatures on mechanical properties. Phase analysis, including presence of vanadium carbide. Tables, graphs. (Q general, J26, J29, ST)

**498-Q.** (Russian.) **Improving the Quality of Thick Sheet Mild Steel by Simpler Types of Heat Treatment.** V. A. Konopasevich. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 55-59.

Impact toughness and microstructure after normalizing and tempering, quench hardening and rolling. Impact toughness in the zone affected by welding, in quench hardened and normalized steels. Micrographs, tables, graphs. (Q6, M27, J general ST)

**499-Q.** (Russian.) **Methods for the Analysis of Fatigue Cracks.** A. M. Zaitsev. *Zavodskaia Laboratoriia,* v. 22, no. 4, Mar. 1956, p. 472-478.

Survey of methods. Nature, structure and causes of fatigue cracking, including "brittle slip", zone differences and microcracks. Micrographs, photographs. 6 ref. (Q7)

**500-Q.** (Russian.) **Effect of Ternary Metallic Compound E(AlCrMg) on the Heat Resistance of Aluminum Alloys.** B. K. Vul'f and M. N. Chernov. *Zhurnal Neorganisheskoi Khimii,* v. 1, no. 1, 1956, p. 158-162 + 1 plate.

Hardness of the ternary compound at 20 and 300° C. Effect of this compound and its proportion in composition on the short-term strength and long-term strength of aluminum alloys at 300° C. Microhardness and microstructure after pressing and heat treatment. Micrographs, diagrams, tables, graphs. 11 ref. (Q23, Q29, M27, Al)

**501-Q.** (Spanish.) **Low-Temperature Brittleness Tests and Determination of the Transition Zone in Steels.** Francisco Cacho Falco and Jorge Barrenechea Aberasturi. *Instituto del Hierro y del Acero,* v. 9, no. 44, Mar. 1956, p. 306-314.

Study of the dependence between the transition temperature of brittleness of carbon steels and their carbon and manganese contents. Tables, graphs, micrographs. 5 ref. (Q23, ST, Mn)

**502-Q. The Creep Properties of Thorium.** A. D. Schwope, L. L. Marsh and F. R. Shober. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-866, Sept. 1953, 15 p.

Results indicate that design considerations for the use of thorium under cyclic load conditions in the temperature range from 200 to 600° F. should be based largely on fatigue strength rather than on creep strength. Tables, graphs. 3 ref. (Q3, Q7, Th)

**503-Q. Metallurgical Requirements of Metals for Steam Service Above 1000° F.** F. B. Foley and R. M. Wilson, Jr. *Blast Furnace and Steel Plant,* v. 44, May 1956, p. 508-512.

Requirements and attempts to indicate directions in which some of the inherent problems may find a solution. Diagrams, graph, tables. (Q23, T25, ST)

**504-Q. Fatigue Tests on End Closures for Model Headers.** P. H. R. Lane. *British Welding Journal,* v. 3, May 1956, p. 200-205.

Pulsating pressure fatigue tests on a number of designs for end closures for 6-in. diam., mild steel pipe. Photographs, graph, tables, diagrams. 3 ref. (Q7, K1, ST)

**505-Q. Processing Under Extreme Conditions. Effects of Hydrogen on Properties of Metals.** D. D. Perlmutter and B. F. Dodge. *Industrial and Engineering Chemistry,* v. 48, May 1956, p. 885-893.

Over 50 specimens were exposed to hydrogen gas atmospheres at pressures between 7500 and 60,000 psi. at room temperature and to pressures of 15,000 and 30,000 psi. at temperatures up to 500° C. with exposure time varying between 6 hr. and 60 days. Graphs, diagrams, tables. 52 re. (Q23, Ni)

**506-Q. Full-Scale Fatigue Tests of Diesel Engine Elements.** P. E. Wiene. *Institute of Marine Engineers, Transactions,* v. 68, Mar. 1956, p. 39-46; disc., p. 47-59.

Rotary bending tests, springs, cast iron, notch sharpness, tension-compression tests, crankshafts, piston rods, shrunk joints, welded elements. Photographs, graphs, diagrams, tables, micrographs. 3 ref. (Q7, S21, CI, ST)

**507-Q. At Elevated Temperatures Low Carbon, Low Nitrogen Improve Stainless Properties.** F. C. Monkman and N. J. Grant. *Iron Age,* v. 177, May 31, 1956, p. 67-70.

Effects of vacuum melting on uniformity, strength and stability of stainless steels. Graphs, tables. (Q general, D8, SS)

**508-Q. Physics of Solids—Plastic Flow.** Pol Duwez. *Journal of the Aeronautical Sciences,* v. 23, May 1956, p. 435-437, 468.

Plastic flow and fracture under combined stresses; theory of specific heat of solids; propagation of plastic deformation in solids. Photograph. 12 ref. (Q24, Q26)

**509-Q. Fiber Textures in Uranium.** Anna M. Turkalo, J. E. Burke and A. N. Holden. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission), KAPL*-428, Aug. 1950, 17 p.

Fiber textures produced in a series of uranium rods, each of which was swaged at a different temperature from room to 600° C. explained in terms of crystallographic mechanisms of deformation. Table, micrographs, diagrams. 9 ref. (Q24, U)

**510-Q. Remote Operating "Tukon" Hardness Tester.** E. R. Craig and R. F. Stearns. *General Electric Company, Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission), KAPL*-1523, Dec. 1955, 13 p. + 6 plates.

Apparatus for determining micro and macrohardness utilizes a closed circuit television system to bring the microscope image to the outside of a shielded cell. Photographs, diagram. (Q29)

**511-Q. Metals for Low Temperatures.** Allan L. Tarr. *Machine Design,* v. 28, May 31, 1956, p. 111-116.

Factors affecting metal failure. Mechanical properties of steels and nonferrous alloys. Table, graphs. (Q general, ST, EG-a)

**512-Q. The Presentation of Fatigue Data for Fatigue Life Calculations.** C. L. Bore. *Royal Aeronautical Society, Journal,* v. 60, May 1956, p. 331-346.

A simple and convenient "endurance chart" for the presentation of basic fatigue data which shows the effects of mean stress, residual stress and pre-tension, and displays several interesting features of the data. Tables, graphs, diagrams. 10 ref. (Q7)

**513-Q. Elevated-Temperature Fatigue Properties of Two Titanium Alloys.** William K. Rey. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* 56B07, Apr. 1956, 28 p.

Unnotched fatigue properties investigated at temperatures up to 1000° F. Tables, photograph, diagram, graphs. 1 ref. (Q7, Ti)

**514-Q. Effect of Residual Stresses in Surface of Metals Upon Wear Resistance.** P. E. D'yachenko and T. V. Smushkova. *Henry Brutcher Translation No.* 3713, 7 p. (Condensed from *Vestnik Mashinostroeniya,* v. 35, no. 3, 1955, p. 38-40) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 510-Q, 1955. (Q9, Q25, ST, CI)

**515-Q.** (English.) **Slip in Crystals of the Caesium Chloride Type.** W. A. Rachinger and A. H. Cottrell. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 109-113.

Experiments made with various single crystals, the conventional method of slip traces and the prismatic punching method of Smakula and Klein being used to determine the glide elements. Table, micrograph. 13 ref. (Q24)

**516-Q.** (English.) **The Influence of Hydrogen on the Yield Point in Iron.** H. C. Rogers. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 114-117.

Two related mechanisms for the suppression of the yield point in iron by hydrogen discussed. Graphs. 2 ref. (Q23, Fe)

**517-Q.** (English.) **The Temperature Dependence of the Elastic Constants of Gold-Cadmium Alloys.** Stanley Zirinsky. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 164-171.

Temperature dependence of the dynamic elastic constants of body-centered cubic alloys that undergo diffusionless phase change determined as a function of composition variation within the beta phase, and heat treatment prior to measurement. Graphs, diagrams, tables, 23 ref. (Q21, Au, Cd)

**518-Q.** (English.) **Propagation of Lüder's Bands in Steel Wires.** J. C. Fisher and H. C. Rogers. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 180-185.

Annealed steel wires were deformed at constant load by hanging weights on the wires. Propagation was observed visually through the cracking of a brittle lacquer coating. Graphs, diagram. 8 ref. (Q23, Q25, ST)

**519-Q.** (English.) **The Critical Shear Stress in α-Brass as a Function of Zinc Concentration and Temperature.** R. E. Jamison and F. A. Sherrill. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 197-200.

Single-crystal tensile specimens of α-brass of various compositions up to 30 at. % zinc were pulled at four temperatures to measure the critical shear stress. Table, graphs. 15 ref. (Q2, Zn)

**520-Q.** (English.) **An Electron Diffraction Study on the Plastic Deformation of Aluminium Single Crystals.** Kazuo Kimoto. *Physical Society of Japan, Journal,* v. 11, no. 5, May 1956, p. 485-495.

Plastic deformation studied through Kikuchi lines of electron diffraction by the large angle convergent beam method. Diffractograms, diagrams, table. 21 ref. (Q24, Al)

**521-Q.** (English.) **Study of Plastic Deformation in Aluminium Crystals by Electron Diffraction and Electron Microscopy.** F. E. Fujita, D. Watanabe, M. Yamamoto and S. Ogawa. *Physical Society of Japan, Journal,* v. 11, no. 5, May 1956, p. 502-515.

Suitably oriented single crystals subjected to tensile deformation of various amounts investigated by electron diffraction together with ordinary microscopy, interferometer microscopy and electron microscopy. Graph, tables, diagrams, micrograph, diffractograms. 10 ref. (Q24, M21, M22, Al)

**522-Q.** (English.) **Intersection of (301), (101) Twin Bands in Tin.** Saiyu Maruyama and Hiroshi Kiho. *Physical Society of Japan, Journal,* v. 11, no. 5, May 1956, p. 516-521.

An interpretation for the mechanisms of additional twinning processes obtained from the results of shear strain measurements around intersections. Micrographs, tables, diagrams. 10 ref. (Q24, Q6, Q2, Sn)

**523-Q.** (German.) **Residual Stress of Unstable Austenite Manganese Steels From Thermal Treatment.** Hans Bühler and Elmar Herrmann. *Archiv für das Eisenhüttenwesen,* v. 27, no. 4, Apr. 1956, p. 269-274.

Residual stress and hardness investigations of hard manganese steel with 1.2% carbon and 13.6% manganese at different rates of thermal treatment. Graphs, diagram. 10 ref. (Q25, Q29, AY)

**524-Q.** (Italian.) **Influence of Iron and Silicon Contents on the Fatigue Resistance of Ergal.** F. Gatto, *Alluminio,* v. 25, no. 4, Apr. 1956, p. 175-186; disc., p. 186.

Influence of different iron and silicon contents on the fatigue resistance under rotative bending stress of Ergal-type alloys. More alloying decreases the resistance to fatigue. Tables, graphs, diagrams, micrographs, photographs. 8 ref. (Q7, Al)

**525-Q.** (Italian.) **Results of Practical Service Tests Carried Out on Aluminum-Tin-Base Antifriction Light Alloys.** N. Collari and L. Paglialunga. *Alluminio,* v. 25, no. 4, Apr. 1956, p. 187-191.

Three alloys were tested; one with the highest tin content was best. Tables, graph, diagrams, micrographs, photographs. 4 ref. (Q9, Al, Sn)

**526-Q.** (Italian.) **Principal Corrective Elements for Cast Iron and Steel. Their Influence and Use.** *Fonderia,* v. 5, no. 4, Apr. 1956, p. 189-194.

Use of molybdenum and nickel for improving the properties of cast iron and steel. (To be continued.) (Q general, Mo, Ni, CI)

**527-Q.** (Russian.) **Effect of Certain Processes of Heat Treatment on the Tendency to Delayed Fracture of Steel With a Yield Point of 120-140 Kg. Per Sq. Mm.** L. M. Pevzner, V. E. Sadovskii, T. K. Zilova, S. S. Volkov and Ia. M. Potak. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 5-14.

Effect of conditions of tempering and annealing on tendency to brittle fracture under action of hydrogen and stresses. Role of heat treatments, coatings, microhardness and structure in delayed fracture of bolts under prolonged strain in skewed or over-tightened condition. Tables, graphs. 11 ref. (Q23, Q26, J general, AY)

**528-Q.** (Russian.) **Effect of Residual Austenite, Obtained by Quench Hardening, on the Impact Toughness and Type of Fracture in Highly Tempered Chromium-Nickel-Molybdenum Steel.** A. P. Guliaev and I. I. Slavina. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1956, p. 15-17.

Effect of cooling conditions on fibrous or crystalline fracture. Effect of tempering and quenching on residual austenite and the resulting increase of the critical temperature of brittleness and worsening of the type of fracture. Graphs, table. 2 ref. (Q6, Q26, Q23, J26, J29, AY)

**529-Q.** **The Physical Meaning of Indentation and Scratch Hardness.** D. Tabor. *British Journal of Applied Physics,* v. 7, May 1956, p. 159-166.

Indentation-hardness and scratch-hardness measurements of metals and of minerals are essentially a measure of the plastic yield properties of the material under examination. Tables, graphs, diagrams. 15 ref. (Q29)

**530-Q.** **A Photoelastic Method of Two-Dimensional Separation of Stresses Along a Line of Symmetry by Using the Isochromatic Fringes Only.** S. P. Christodoulides. *British Journal of Applied Physics,* v. 7, May 1956, p. 190-194.

General expressions are established in which the equations of equilibrium are referred to any system of orthogonal curvilinear coordinates. Graph, diagrams, tables, photograph. 3 ref. (Q25)

**531-Q.** **Some Metallographic Observations on the Fatigue Failure of Bare and Clad Aluminium-Copper-Magnesium Alloy Sheet.** J. J. Sebisty and J. O. Edwards. *Institute of Metals, Journal,* v. 84, Apr. 1956, p. 291-297.

Form and extent of crack damage in the clad material was influenced by the thickness of the specimen, the stress and the number of cycles. With the bare material, fatigue damage was highly localized, since the first cracks to appear tended to be preferentially propagated to failure without the formation of additional cracks. Diagrams, tables, graphs. 7 ref. (Q7, Al)

**532-Q.** **Slip-Band Extrusion.** E. A. Calnan and Betty E. Williams. *Institute of Metals, Journal,* v. 84, Apr. 1956, p. 318 + 10 plates.

Electron micrographs of copper indicate the occurrence of slip-band extrusion in simple tensile deformation. This may be due to slip on parallel planes in different directions. Photographs, micrographs, diagrams. 1 ref. (Q24, Q27, Cu)

**533-Q.** **The Properties of 2¼% Cr-1% Mo Steel.** M. G. Gemmill and J. D. Murray. *Iron and Steel,* v. 29, May 1956, p. 173-177.

Welding and stress raisers as they affect the material's performance under service conditions. Graph, micrographs, diagram, tables. 7 ref. (Q25, AY)

**534-Q.** **The Mechanical Properties of Carbon Steel Wire at Low Temperatures.** R. W. Nichols. *Iron and Steel Institute, Journal,* v. 182, Apr. 1956, p. 337-347.

The effects of low temperature on the tensile, fatigue and reverse-bend strength of steel wire, and the influence of electrogalvanizing on these properties. Micrographs, photograph, graphs, diagram, tables. 15 ref. (Q general, L17, Zn, CN)

**535-Q.** **The Hardness of Some Carbon and Low-Alloy Steels at Low Temperatures.** R. W. Nichols. *Iron and Steel Institute, Journal,* v. 182, Apr. 1956, p. 348-354.

Diamond pyramid and ball-hardness tests were made at + 18, − 70, and − 196° C. on light steels for which the low-temperature tensile properties had been determined. Graphs, tables, diagram. 9 ref. (Q29, CN, AY)

**536-Q.** **Stress-Strain Curves of Some Metals and Alloys at Low Temperatures and High Rates of Strain.** H. G. Baron. *Iron and Steel Institute, Journal,* v. 182, Apr. 1956, p. 345-365.

Comparative tensile tests were carried out on some common engineering metals and alloys. Graphs, diagram, table, micrographs, oscillograms. 32 ref. (Q27, Al, Cu, ST)

**537-Q.** **Effect of Phosphorus Content on Impact Value of Fully and Partially Hardened and Tempered Mn-Mo Steels.** N. P. Allen and C. C. Earley. *Iron and Steel Institute, Journal,* v. 182, Apr. 1956, p. 375-388.

Steels, after tempering, showed a progressive rise of impact transition temperature with increase of phosphorus content, but the impact transition temperatures of the fully hardened steels were consistently lower than those of the corresponding partially hardened steels. Micrographs, graphs, tables. 7 ref. (Q6, AY)

**538-Q.** **Stress Theory of Plastic Flow.** D. Trifan. *Journal of Mathematics and Physics,* v. 35, Apr. 1956, p. 44-52.

Mathematical theory of plastic flow for incompressible, isotropic, strain-hardening materials exhibiting a gradual transition from the elastic to the plastic state. Graph. 17 ref. (Q24)

**539-Q.** **Deformations of an Elastic-Plastic Cylindrical Shell With Linear Strain Hardening.** P. G. Hodge, Jr., and F. Romano. *Journal of the Mechanics and Physics of Solids,* v. 4, May 1956, p. 145-161.

Complete solution is obtained directly from the governing equations. Various limiting cases are considered, including elastic, perfectly plastic and rigid strain hardening. Results are applied to an example, and salient features are shown graphically. Graphs. 8 ref. (Q24, Q25)

**540-Q.** **On Conjugate States of Plane Strain.** W. Prager. *Journal of the Mechanics and Physics of Solids,* v. 4, May 1956, p. 167-171.

Duality principle applies quite generally to pairs of incompressible solids such that the relation between the stresses and the strains in one solid has the same mathematical structure as the relation between the strains and the stresses in the other. Diagrams. 1 ref. (Q25)

**541-Q.** **The Tearing of Aluminium Foils.** J. Hennephof. *Journal of the Mechanics and Physics of Solids,* v. 4, May 1956, p. 172-183.

The energy for tearing a unit length out of the foil consists of the energy for bending the foil and the energy for the plastic deformation of the borders of the tear. Table, graphs, diagrams. 1 ref. (Q26, Al)

**542-Q.** **Associated Problems in Two-Dimensional Elasticity.** J. E. Adkins. *Journal of the Mechanics and Physics of Solids,* v. 4, May 1956, p. 199-205.

A method for the simultaneous solution of two or more problems, with analytically similar boundary conditions, in two-dimensional elasticity. 9 ref. (Q21)

**543-Q.** **Low-Temperature Fatigue Testing of Copper.** *Metallurgia,* v. 53, no. 319, May 1956, p. 212-213, 216.

Both fatigue resistance and ultimate tensile strength increased at low temperatures. Table, graph, photographs. (Q7, Cu)

**544-Q.** **Creep and Stress-Rupture Tests on Molybdenum-Vanadium Weld**

**Metal and Welds in Molybdenum-Vanadium Steel Using Vanadium-Bearing Electrodes.** R. P. Kent. *Metal Treatment and Drop Forging,* v. 23, May 1956, p. 193-202.

Creep and rupture properties of weld metal compared with those of the parent metal in the normalized and tempered condition. Graphs, diagram, tables. 6 ref. (Q3, Q4, K9, AY)

545-Q. **Thermal Fatigue Testing of Sheet Metal.** H. E. Lardge. *Sheet Metal Industries,* v. 33, no. 349, May 1956, p. 299-306.

Test is based on heating a test specimen with a central hole to 1650° F. and then cooling it rapidly in a blast of cold air. Micrographs, diagrams, tables, photograph, graphs. (Q7)

546-Q. **Repeated Load Tests of Forged 75S-T6 Aluminum Alloy Specimens With Protruding Lugs.** Darnley M. Howard. *U. S. Department of Commerce, National Bureau of Standards,* NBS Report 4051, May 1955, 37 pages.

Fatigue strength decreased as lug width increased and fillet radii decreased. Lug height had no effect. Tables, photographs, graphs. 7 ref. (Q7, Al)

547-Q. **Elevated-Temperature Fatigue Properties of Two Titanium Alloys.** William K. Rey. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* NACA RM 56B07, Apr. 1956, 28 p.

Test results presented in tabular form and as curves of stress versus cycles to failure for each test temperature. Tables, photograph, graphs, diagram. 1 ref. (Q7, Ti)

548-Q. **Report on Elevated Temperature Properties of Titanium.** W. Lee Williams. *U. S. Naval Engineering Experiment Station, Report 4A(2)-066876 NS-013-118,* Oct. 1951, 7 pages + 5 plates.

Tensile, creep and stress-rupture properties are reported up to 900° F. for both annealed and cold worked unalloyed titanium produced from a single ingot arc melted in graphite. Tables, graphs. 3 ref. (Q27, Q3, Q4, Ti)

549-Q. **Notch Ductility of Weld Metal.** William S. Pellini. *Welding Journal,* v.35, May 1956, p. 217s-233s.

Role of weld metal notch ductility in determining the performance of weldments. Photographs, table, graphs, diagrams. 20 ref. (Q23, K9, ST)

550-Q. **Effect of Annealing (650° C.) on Bending Fatigue of Large Welding Test Pieces.** P. E. Wiene. *Welding Journal,* v. 35, May 1956, p. 261s-264s.

Annealing of heavy engine parts after welding was found to be justified because of the resultant increase in bending fatigue strength. Graphs, diagrams, tables. 6 ref. (Q7, J23, ST)

551-Q. **Mechanical Properties Evaluation of Zircaloy-3.** F. Forscher. *Westinghouse Electric Corporation, Bettis Plant (U. S. Atomic Energy Commission),* WAPD-143, Mar. 1956, 47 p.

Strength, ductility, impact resistance and hardness of the three tentative Zircaloy-3 compositions compared to Zircaloy-2 properties at several temperatures and heat treatment conditions. Tables, diagrams, micrographs, graphs. 8 ref. (Q general, Zr)

552-Q. (French.) **Remarks on the Relationship Existing Between Tensile Strength, Modulus and Hardness in Low-Phosphorus Unalloyed Gray Cast Irons.** Michel Ferry. *Fonderie,* no. 123, Apr. 1956, p. 143-150.

Investigates dependence of the modulus of elasticity and hardness on structure of graphite and the matrix. Tables, graphs. 13 ref. (Q21, Q29, Q27, CI)

553-Q. (French.) **Shrinkage Phenomenon During a Tensile Stress Test on Tubes.** H. de Leiris. *Revue de Métallurgie,* v. 53, no. 1, Jan. 1956, p. 37-47.

Distance between marks on circular-section tubes must be proportional to the outside diameter. Diagrams, graphs, photographs, tables. (Q27)

554-Q. (French.) **Structure Alterations of Aluminum Under the Double Effect of Distortion and Annealing.** F. Provost. *Revue de Métallurgie,* v. 53, no. 1, Jan. 1956, p. 63-66.

Samples of commercial aluminum were submitted to hot rolling tests with intermediate annealing periods of varying length; texture variations observed. Graphs, micrographs, photographs. (Q24, Al)

555-Q. (French.) **Disorganization and Cold Restoration of Aluminum Monocrystals Subjected to Small Tensile Stresses.** Jules Caisso. *Revue de Métallurgie,* v. 53, no. 1, Jan. 1956, p. 57-62.

Disturbances in the texture of aluminum monocrystals resulting from tensile stresses studied by a long-distance focalization method. Graphs, photographs. 7 ref. (Q24, N5, Al)

556-Q. (French.) **A Comparative Study of the High-Temperature Strength of Some Industrial Alloys Mainly Constituted of Magnesium.** J. Le Gall and G. Sertour. *Revue de Métallurgie,* v. 53, no. 4, Apr. 1956, p. 241-247.

General survey of tensile and creep tests on magnesium-aluminum, magnesium-zinc-rare earth, magnesium-rare earth and magnesium-thorium alloys. Mechanical characteristics and uses. Graphs, micrographs. (Q3, Q27, Mg)

557-Q. (French.) **Some Observations on Residual Stresses in Light Alloy Quenched Pieces as a Function of the Cooling Conditions.** M. Tournaire and M. Renouard. *Revue de Métallurgie,* v. 53, no. 4, Apr. 1956, p. 255-259; disc., p. 259-262.

Tests on press-extruded duralumin bars showed no satisfactory quench process; hot-water quench gave best results. Micrographs, graphs. (Q25, J26, Al)

558-Q. (French.) **Effects of Quenching and Tempering on Aluminum-Magnesium Alloys Containing, as Impurity or Secondary Constituent, Silicon in Proportions of 0 to 1%.** J. Rigal and M. Renouard. *Revue de Métallurgie,* v. 53, no. 4, Apr. 1956, p. 263-269; disc., p. 269-270.

Mechanical characteristics are strongly improved by quenching and tempering. Table, graphs. (Q general, J26, J29, Al)

559-Q. (French.) **The Development of Alloys Containing Mainly Nickel and Chromium for Use at High Temperature.** W. Betteridge and A. W. Franklin. *Revue de Métallurgie,* v. 53, no. 4, Apr. 1956, p. 271-284.

Influence of composition, structure and thermal treatment on creep properties. Important properties of commercial alloys. Tables, diagrams, micrographs, graphs. 13 ref. (Q3, SG-h, Cr, Ni)

560-Q. (German.) **New Methods for the Determination of Coefficients in Plastic Deformation.** Zygmunt Wusatowski. *Neue Hütte,* v. 1, no. 5, Mar. 1956, p. 275-279.

Derivation of general relations for plastic deformation processes. Diagrams, graph, tables. 4 ref. (Q24)

561-Q. (German.) **Tensile and Folding Tests of Fusion-Welded Butt Joints.** H. Fiehn and K. Teske. *Schweissen und Schneiden,* v. 8, no. 5, May 1956, p. 158-163.

Tensile tests of test bars. Effect of bending angle and bending strain in notch-folding tests. Influence of machining, bending mandrel diameter and thickness of specimen. Tables, graphs, photographs. 6 ref. (Q27, Q5, K9)

562-Q. (Polish.) **Effect of Hardening of White Cast Iron on Strength, Hardness and Structure of Pearlitic Malleable Cast Iron.** Mikolaj Dubowicki, Waclaw Sakwa, and Stefan Pieprznik. *Przeglad Odlewnictwa,* v. 6, no. 4, Apr. 1956, p. 97-103.

Testing of white cast iron (quench-hardened and nonquench-hardened) for tensile strength, microstructure and hardness before graphitizing. Effect of previous hardening on mechanical properties and microstructure of pearlitic malleable cast iron graphitized in an electric furnace. Micrographs, tables, graphs. (Q23, Q9, J26, M27, CI)

563-Q. (Russian.) **Measurement of Wear of Parts in an Engine by Means of Radioactive Isotopes.** D. I. Vysotskii and V. S. Zabel'skii. *Avtomobil'naia i Traktornaia Promyshlennost,* no. 4, Apr. 1956, p. 26-28.

Method, principles, measurement instruments. Graphs, diagrams. 3 ref. (Q9, S19, ST)

564-Q. (Russian.) **Static Strength of Longitudinal Butt and Lap Welded Joints.** B. F. Lebedev. *Avtomaticheskaia Svarka,* v. 9, no. 2, Mar.-Apr. 1956, p. 48-57.

Study of longitudinal butt and lap joints of openhearth and bessemer construction steels. Advantages of butt over lap joints. Diagrams, tables, photographs. 3 ref. (Q23, K9, ST)

565-Q. (Russian.) **Static Strength of Spot-Welded Joints.** A. N. Dorofeev. *Avtomaticheskaia Svarka,* v. 9, no. 2, Mar.-Apr. 1956, p. 58-67.

Theoretical analysis of a longitudinally spot-welded joint working in the elastic and the elastic-plastic ranges shows that the spots do not work uniformly. Findings are proved experimentally. Diagram, table, graphs. 12 ref. (Q23, K3)

566-Q. (Russian.) **Relaxation Resistance of Springs of Steel 50 KhFA and a Method for Increasing It.** I. N. Rochlin. *Teploenergetika,* v. 3, no. 5, May 1956, p. 40-42.

At temperatures above 300°C. this steel has low relaxation resistance, despite high yield point. Method of preloading to increase relaxation resistance for temperature of 300 to 350°C. Tables, graphs. 3 ref. (Q3, SG-b)

567-Q. (Spanish.) **Study of Brittleness of Cast Steels on U and V-Notch Charpy Test Pieces.** A. Audigé. *Ciencia y Técnica de la Soldadura,* v. 6, no. 29, Mar.-Apr. 1956, 8 p.

Results of tests conducted on unkilled, semikilled and killed steel specimens. Comparison with foreign tests. Tables, graphs. 7 ref. (Q23, Q6, ST)

568-Q. (Pamphlet.) **V-Notch Charpy Impact Testing of Weld Metal and Heat-Affected Zone Simultaneously.** William P. Hatch, Jr., and Carl E. Hartbower. Watertown Arsenal Laboratory Report No. WAL 401/220, Dec. 1955. 17 p.

Method for evaluating relative notch-toughness characteristics of

weld metal and heat affected base metal in a natural environment. (Q6)

**569-Q.** (Book.) **Mathematical Theory of Elasticity.** I. S. Sokolnikoff. 2nd Ed. 476 p. 1956. McGraw-Hill Book Co., 330 W. 42 St., New York 36, N. Y.

Analysis of strain and stress; equation of elasticity; extension, torsion and flexure of beams; two and three-dimensional electrostatic problems; variational methods. (Q21)

**570-Q.** (Book.) **Surveys in Mechanics.** G. K. Batchelor and R. M. Davies, editors. 475 p. 1956. Cambridge University Press, Bentley House, N.W. 1, London, England.

Collection of surveys of present position of research in such subjects as deformation in metals, stress waves in solids, rotating fluids, drops and bubbles, atmospheric turbulence and mechanics of sailing ships and yachts. Pertinent papers abstracted separately. (Q general)

**571-Q.** (Book-English.) **Evaluation of a Method for Determining the Tendency of Mild Steel to Brittle Fracture.** Report No. SR 532/1 A. 2nd Ed. 99 p. 1955. Centrum voor Lastechniek N.V.L.-T.N.O., The Hague, Netherlands.

Numerous tests, both dynamic and static, carried out on various types of impact and notch-bend specimens at different temperatures. (Q26, Q5, Q6, ST)

# R

## Corrosion

**262-R. Collection and Correlation of High Temperature Hydrogen Sulfide Corrosion Data.** *Corrosion,* v. 12, May 1956, p. 213-234.

Corrosion by gas mixtures containing hydrogen sulfide at elevated temperatures reviewed, with particular emphasis on the types of environments present in catalytic reforming and desulfurizing units of petroleum refineries. Graphs, photograph, tables. 86 ref. (R9)

**263-R. Corrosion Mitigation in a Metropolitan Area.** M. C. Miller. *Corrosion,* v. 12, May 1956, p. 247-253.

How utility companies participated jointly in the designing and installaton of a cathodic protection system to provide protection to all metallic structures in a certain downtown area; 11 50-amp. rectifiers were installed at selected locations throughout the area. Diagrams, photograph. (R10, R8)

**264-R. An Application of Cathodic Protection to the Inside of a Tank.** J. H. Graves. *Corrosion,* v. 12, May 1956, p. 254-256.

Results of cathodic protection against internal corrosion of a 10,000-bbl. tank. It is calculated that four 17 lb. anodes would last 3 to 4 yr. Graphs. (R10, R7)

**265-R. Cell Corrosion on Lead Cable Sheaths.** *Corrosion,* v. 12, May 1956, p. 257-259.

Action in a concentration cell described and shown in accompanying diagram. Attack by differential aeration cell action and a case involving galvanic corrosion of a lead telephone cable sheath. Diagrams, photographs. (R1, Pb)

**266-R. Low-Temperature Corrosion by Flue-Gas Condensates. III.** R. W. Kear. *Corrosion Technology,* v. 3, Apr. 1956, p. 125-127.

Methods of reducing corrosion by flue-gas condensates, including fuel selection and the addition of inerts, dusts and smokes. 30 ref. (R9, R5)

**267-R. Dissolution of Cadmium in Chromic Chloride Solutions.** Cecil V. King and Edward Hillner. *Electrochemical Society, Journal,* v. 103, May 1956, p. 261-265.

Dissolution rate of cadmium was determined in dilute chromic chloride solutions containing hydrochloric acid up to 4M as functions of concentration, stirring speed and temperature. The potential of the metal in these solutions is essentially that of the cadmium-cadmium ion couple, and there is little if any anodic polarization. Graphs, tables. 15 ref. (R2, Cd)

**268-R. High Pressure Oxidation of Metals—Tungsten in Oxygen.** J. P. Baur, D. W. Bridges and W. M. Fassell, Jr. *Electrochemical Society, Journal,* v. 103, May 1956, p. 266-272.

An investigation of the oxidation behavior of tungsten over the temperature range from 600 to 850° C. and oxygen pressures from 20 to 500 psia. Graphs, photographs, tables. 26 ref. (R2, W)

**269-R. Oxidation of Oxygen-Free High Conductivity Copper to $Cu_2O$.** J. P. Baur, D. W. Bridges and W. M. Fassell, Jr. *Electrochemical Society, Journal,* v. 103, May 1956, p. 273-281.

Oxidation behavior of high-purity oxygen-free high-conductivity (OFHC) copper at temperatures of 900, 950 and 1000° C. at oxygen pressures which permit the formation of $Cu_2$ alone. Diagram, graphs, micrographs, tables. 47 ref. (R2, Cu)

**270-R. Corrosion of Copper-Gold Alloys by Oxygen-Containing Solutions of Ammonia and Ammonium Salts.** J. I. Fisher and J. Halpern. *Electrochemical Society, Journal,* v. 103, May 1956, p. 282-286.

Copper-gold alloys, ranging in gold content from zero to 15 at. %, were exposed to stirred aqueous solutions of ammonia and ammonium salts under oxygen partial pressures of up to 6.8 at. Effect on the kinetics of solution composition, oxygen pressure and temperature. Graphs. 9 ref. (R5, Cu, As)

**271-R. Acceleration of the Dissolution of Iron in Sulfuric Acid by Ferric Ions.** Harry C. Gatos. *Electrochemical Society, Journal,* v. 103, May 1956, p. 286-291.

The role of $Fe^{+++}$ on the dissolution of iron in acids was investigated quantitatively; the changes in hydrogen evolution which result from the presence of $Fe^{+++}$ were also studied. Graphs, tables. 8 ref. (R2, Fe)

**272-R. The Influence of Mercury on Aluminum Corrosion.** D. R. de Halas. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-28129, May 1953, 35 p.

Tests used a heated recirculating water system containing metallic mercury and various concentrations of mercury ion to determine the pitting tendency of mercury on aluminum slugs. Graph, table, photographs. 10 ref. (R4, R6, Hg, Al)

**273-R. Inhibition and Inhibitors.** Hellmuth Fischer. *Industrial Finishing (London),* v. 9, Apr. 1956, p. 486 + 5 pages.

How corrosion inhibitors function; technical applications. Diagrams. (R10)

**274-R. An Investigation Into the Air-Heater Corrosion of Oil-Fired Boilers.** B. Lees. *Institute of Fuel, Journal,* v. 29, Apr. 1956, p. 171-175.

Methods which have been successfully applied to reduce the fouling and wastage. Future experiments to ascertain optimum operating conditions and the most suitable air-heater design. Diagrams, graphs, table. 3 ref. (R9)

**275-R. Statistical Analysis of the Corrosion of Uranium. II. Effects of Rolling and Alpha Annealing on Uranium Exposed to Moist Helium.** J. T. Waber. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission),* LA-1577, May 1952, 34 p.

No definite effect was observed on the detailed corrosion behavior of the specimens as a result of rolling or annealing. Graphs, tables. 2 ref. (R11, F23, J23, U)

**276-R.** (German.) **Systematic Investigations to Test the Anticorrosive Efficacy of VPI Upon a Number of Common Metals.** Wener Paul. *Werkstoffe und Korrosion,* v. 7, no. 4, Apr. 1956, p. 189-198 + color plate.

The effect of vapor phase inhibitor protection on the behavior of many common metals and alloys was investigated systematically. Provides exact data for industrial application. Photographs, micrographs, table. 4 ref. (R10, Ag, Zn, Cd, Al, Cu, ST)

**277-R.** (Japanese.) **On Scale Penetration in Steel at High Temperatures.** Mitsutoshi Washida, Daisaku Yamamoto and Kiyoshi Yoshida. *Iron & Steel Institute of Japan, Journal,* v. 41, no. 5, May 1955, p. 515-519.

When iron and steel are heated in an oxidizing atmosphere at high temperature, the oxidation scale penetrates into matrix right below the surface scale. A study is presented of the phenomena of this penetration under various conditions using a rimmed steel. Diagram, graphs, photographs. 10 ref. (R2, ST)

**278-R.** (Russian.) **Corrosion Diagrams of Iron and Steels in Oxidizers.** V. P. Batrakov. *Doklady Akademii Nauk SSSR,* v. 107, no. 2, Mar. 11, 1956, p. 269-272.

Concentration of oxidizers in solutions at four different levels. Interrelation of concentration factor, composition of steel, temperature, pH of solution, and anode current density on rate of corrosion. Graphs. 5 ref. (R5, AY, Fe)

**279-R.** (Russian.) **Corrosion-Abrasion Wear in Water Economizers and a Method of Protecting Them.** A. V. Riabchenkov and O. N. Muravkin. *Energomashinostroenie,* no. 3, Mar. 1956, p. 19-23.

Relation between wear of boiler pipes and the angle of attack and speed of flow of hot gases. Longitudinal rods welded on outside of pipe considerably lessen wear and increase service life. Diagrams, graphs, micrographs, photographs. (R1, ST)

**280-R.** (Russian.) **Protection of Underground Gas Mains From Outside Corrosion.** E. S. Makhover. *Gazovaia Promyshlennost',* no. 3, Mar. 1956, p. 20-25.

Electrical equipment, proper anode grounding, electrodrainage, and cathodic protection used in preventing electrochemical corrosion of gas pipeline in contact with soil. Testing equipment. Diagrams, photograph. (R10, R8, ST)

**281-R.** (Russian.) **On the Nature of the Passive Film on Iron in Acid Solutions.** A. M. Sukhotin. *Uspekhi Khimii,* v. 25, no. 3, 1956, p. 312-328.

A review of recent, primarily German, publications on the mechanism of origination, retention and destruction of passive films on iron. Properties of the passive film and problems of activation and passivation of iron in acid solutions. Graphs, table. 45 ref. (R10, Fe)

**282-R.** (Russian.) **Problem of Study of Corrosion Properties of Metals.** I. Oknin. *Zhurnal Prikladnoi Khimii,* v. 29, no. 3, Mar. 1956, p. 360-369.

The time:potential ratio of metal solution, and ratio of reaction between its electrons and the media, are the entire expression of corrosion behavior. Graphs. 9 ref. (R2)

**283-R.** (Russian.) **Kinetics of Corrosion Process.** A. I. Shultin. *Zhurnal Prikladnoi Khimii,* v. 29, no. 3, Mar. 1956, p. 369-379.

Oxidation is conditioned by the difference of the thermodynamic potentials in electrolytes. The process of electrochemical oxidation-reduction is combined by a series of steps: diffusion-migration phenomena, concentrated polarization, and chemical polarization. Electromotive force is used. Graphs. 6 ref. (R1)

**284-R. The Corrosion of Zirconium in 600° F. Water and in 750° F. Superheated Steam.** H. A. Pray and R. S. Peoples. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-T-55, Jan. 1951, 30 p.

The 750° F. steam test discloses corrosion characteristics in a much shorter time than the 600° F. water test. Raising the test temperature from 600 to 750° F. without changing the pressure accelerates attack. Graphs, photographs, tables. (R4, Zr)

**285-R. The Thermal Oxidation and Reduction of a Copper (110) Face.** A. Goswami and Y. N. Trehan. *Faraday Society, Transactions,* v. 52, Mar. 1956, p. 358-362 + 2 plates.

Work was undertaken to study in greater detail the mode of oxidation in air and subsequent reduction by molecular hydrogen of the oxides formed on a nearly (110) face of a single crystal of copper, thus eliminating the variables associated with reactions occurring on a polycrystalline surface. Table, diffractograms. 23 ref. (R2, Cu)

**286-R. Studies in the Corrosion of Metals Occasioned by Aqueous Solutions of Some Surface-Active Agents. IV. Aluminium.** H. Holness and R. D. Langstaff. *Journal of Applied Chemistry,* v. 6, Mar. 1956, p. 115-124.

Action of dilute aqueous solutions of representative anionic, cationic and nonionic wetting agents on aluminum studied, using tap and distilled water. Photographs, graphs. 12 ref. (R5, Al)

**287-R. Study of the Characteristics of the Corrosion Film on Zirconium Using Polarized Light.** Nels Roland Nelson and John Wade Heintz. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission),* TID-5116, May 1952, 213 p.

Without additional investigation, polarized light cannot be used to test the corrosion resistance of a random zirconium sample. (R11, Zr)

**288-R. Corrosivity of Packaging Materials.** E. Wallenberg and B. Järnhäll. *Modern Packaging,* v. 29, May 1956, p. 163 + 9 pages.

A method of quickly determining the electrolyte content of a packaging material as an index of the material's corroding properties. Diagram, photographs, graphs, tables. 11 ref. (R10)

**289-R. Galvanic Corrosion Properties of Titanium and Zirconium in Various Inorganic Solutions.** David Schlain, C. B. Kenahan and Doris V. Steele. *U. S. Bureau of Mines, Report of Investigations 5201,* Apr. 1956, 60 p.

Behavior in contact with some of the common structural metals in several types of inorganic solutions. Diagram, photographs, tables, graphs. 30 ref. (R5, R1, Zr, Ti)

**290-R.** (English.) **The Rates of Oxidation of Several Faces of a Single Crystal of Copper as Determined With Elliptically Polarized Light.** Fred W. Young, Jr., John V. Cathcart and Allan T. Gwathmey. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 145-152.

Rates of oxidation determined at 70, 106, 130, 159 and 178° C. by measuring the increase in thickness of the oxide film as a function of time, using a polarizing spectrometer. Photograph, table, diagrams, graphs. 16 ref. (R2, Cu)

**291-R.** (French.) **$Cu_2O$ and ZnO Single Crystal Formation by Selective Oxidation of an α-Brass Film, Prepared by Vacuum Evaporation.** N. Takahashi and J. J. Trillat. *Acta Metallurgica,* v. 4, no. 2, Mar. 1956, p. 201-205.

Thin films were prepared under vacuum by successive deposition of copper and zinc, oxidized by heating in the specimen chamber of the electron diffraction unit and studied with respect to processes of selective oxidation. Diagrams, diffractograms. 10 ref. (R2, L25, Zn, Cu)

**292-R.** (German.) **Oxidation of Carbide Alloys for Use at High Temperatures.** Josef Hinnüber, Otto Rüdiger and Willi Kinna. *Archiv für das Eisenhüttenwesen,* v. 27, no. 4, Apr. 1956, p. 259-267.

Effect of tungsten, chromium or tantalum-columbium carbide additions on the oxidation ratio and oxide-layer formation of titanium carbide-cobalt alloys in up to 75 hr. at 800 to 1100° C. Table, graphs, diagram, micrographs, photographs. 13 ref. (R2, Ti, Co, C-n)

**293-R.** (German.) **Scale Formation of Sintered Materials on a Silver Base.** Albert Keil. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 243-246.

The use of carbides and borides as nonoxidizing components of silver sinter materials for contacts instead of the pure metals molybdenum and tungsten offers no advantages with regard to scaling properties. Graphs, micrograph. 10 ref. (R2, SG-r, C-n, Mo, W)

**294-R.** (Hungarian.) **New Method for the Direct Microscopic Observation of Electrolytic and Corrosion Processes.** Erik Fuchs and Tibor Baumann. *Kohaszati Lapok,* v. 11, no. 3, Mar. 1956, p. 107-112.

Application of "Reichert MeF" microscope in combination with test vessels. Diagrams, photographs, micrographs. 4 ref. (R11)

**295-R.** (Italian.) **First Stages of Zinc Surface Oxidation (0001).** G. P. Bolognesi. *Metallurgia Italiana,* v. 48, no. 3, Mar. 1956, p. 119-123.

Investigates the oxidation and its characteristics by gas-volumetric measurements and reaction potentials. Tables, graphs, diagram. 14 ref. (R2, Zn)

**296-R. A Systematic Scheme for Examining Corroded Metal Specimens.** J. B. Cotton. *Corrosion Technology,* v. 3, May 1956, p. 141-145.

Procedure using diverse techniques such as microchemical analysis, X-ray examination and metallography to study corrosion failure. Micrographs, diagrams, photographs. (R11)

**297-R. The Composition and Reduction of Oxide Films on Copper.** R. F. Tylecote. *Metallurgia,* v. 53, no. 319, May 1956, p. 191-197.

Reduction rate of cupric and cuprous oxide to copper; mechanism of oxidation and reduction. Photograph, graphs, tables. 12 ref. (R2, Cu)

**298-R. Corrosion Resistance of Titanium.** Andrew N. Eshman. *Product Engineering,* v. 27, June 1956, p. 187-189.

Resistance to galvanic, marine and chemical attack; comparison with stainless steel and aluminum for a wide range of chemicals. Tables, photographs. (R general, Al, SS, Ti)

**299-R.** (English.) **Corrosion as an Electrochemical Process.** Herbert H. Uhlig. *Electrochemical Society, Bulletin of India Section,* v. 5, no. 1, Jan. 1956, p. 11-14.

Theoretical considerations. Graphs, tables. 3 ref. (R1)

**300-R.** (Czech.) **The Influence of Titanium on the Intergranular Corrosion of 18% Cr, 9% Ni Stainless Steel.** Vladimir Cihal, Rudolf Pospisil. *Hutnické Listy,* v. 11, no. 5, May 1956, p. 284-290.

At a superstoichiometric titanium content the quantity of ferrite in 18-9 steels increases. The ferrite decomposes in a brittle sigma phase at temperatures below 800°C. Tables, graphs, photographs, micrographs. 10 ref. (R2, N8, SS, Ti)

**301-R.** (French.) **Contribution to the Study of Corrosion of Steel in Saline Solutions.** A. Hache. *Revue de Métallurgie,* v. 53, no. 1, Jan. 1956, p. 76-79; disc., p. 80.

Influence of temperature and salinity studied according to the dissolved oxygen existing in the saline solutions. Diagram, graphs, table. 4 ref. (R5, ST)

**302-R.** (French.) **Microstructure of a Brittle Beta-Brass With 3.99% Aluminum.** A. R. Bailey and C. Robins. *Revue de Métallurgie,* v. 53, no. 2, Feb. 1956, p. 105-110; disc., p. 110.

Review of literature on intercrystalline stress-cracking of high-tensile β-brasses; detection, by electrolytic polishing methods, of grain boundary grooves in cast and heat-treated specimens of a ternary β-brass. Micrographs. 16 ref. (R1, M27, Cu)

**303-R.** (German.) **Corrosion and Corrosion Testing.** Bruno Waeser. *Werkstoffe und Korosion,* v. 7, no. 5, 1956, p. 256-261.

Definition of corrosion is extended to materials such as wood, stone, metals and plastics. Crystal lattice constants and quotients of volume are characterizing values for the behavior of metal in air. 55 ref. (R1, R3, R11)

**304-R.** (Italian.) **Phenomenon of Cavitation.** L. C. Burrill. *Tecnica Italiana,* v. 21, no. 2, Mar. 1956, p. 95-103.

Physical nature, effects of localized erosion and vibrations and noises caused by cavitation. Some recent experiences and methods of avoiding cavitation. Photographs, diagrams. (R2)

**305-R.** (Russian.) **Study of the Mechanism of Action of Anticorrosive Additives in Oils With the Aid of Tracer Atoms.** Iu. S. Zaslavskii, S. E. Krein, R. N. Shneerova and G. I. Shor. *Khimiia i Teknolgiia Topliva,* no. 4, Apr. 1956, p. 37-49.

A study of the anticorrosive mechanism of alkyl-phenol additives tagged with radioactive sulfur. The protective action of anticorrosive additives is counteracted by the oil whose increasing acidity tends to destroy the protective film formed by the additive on the surface of the metal. Table, graphs. 14 ref. (R10)

**306-R.** (Slovak.) **Corrosion in Welded Constructions.** Kazimir Pospiech. *Zvaranie,* v. 4, no. 12, Dec. 1956, p. 368-373.

Corrosion of welded structures under actual industrial conditions. Laboratory corrosion tests; electrochemical measurements; effect of impurities and microstructure. Tables, graphs, photographs, diagram. 21 ref. (R general, M27, Fe, ST)

**307-R.** (Book-French.) **Stainless and Refractory Steels.** L. Colombier and J. Hochmann. 526 p. 1955. Dunod, 92 rue Bonaparte, Paris 6, France.

General properties and corrosion resistance of stainless steels and the main refractory steels and alloys. Methods of corrosion testing and the action of various corrosive mediums. Chemical and mechanical resistance at high temperatures. Production processes and applications.
(R general, Q general, SS)

# S

## Inspection and Control

**304-S. Application of Radiography in the Manufacture of Bronze Castings.** N. A. Kahn, Solomon Goldspiel and R. R. Waltien. *American Foundrymen's Society, Preprint No.* 56-3, 1956, 18 p.

A series of radiographs and allied material to illustrate the application and value of radiography in the bronze foundry. Includes brief discussion of radiography and the importance of standards for its optimum utilization. Diagrams, graph, radiographs, gammagraphs, photographs. 19 ref. (S13, E general, Cu)

**305-S. Practical Foundry Application of Statistical Quality Control.** Ross Martin, Jr. *American Foundrymen's Society, Preprint No.* 56-53, 1956, 3 p.

Establishing standard variation in process, applying control charts, controlling casting weight, molding sand control in foundry. (S12)

**306-S. A Survey of Uranium Metal-Testing Methods.** J. L. Hyde. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-4801, May 1952, 17 p.

Theory and practice of reactor testing; other methods for determining quality of uranium. Tables. 26 ref. (S11, S general, U)

**307-S. Analysis of Electroplating Solutions. Estimation of Boric Acid in the Presence of Nickel and Ammonium Salts.** M. R. Verma and K. C. Agrawal. *Metal Finishing,* v. 54, May 1956, p. 64-65.

Method developed for determining boric acid by the formaldehyde method in the presence of nickel and ammonium salts and the factors affecting these determinations. 9 ref. (S11, L17, Ni)

**308-S. The Use of Radioactive Isotopes in Metallurgical Research.** S. M. Makin. *Metal Treatment and Drop Forging,* v. 23, Apr. 1956, p. 127-130.

Review of metallurgical work now in progress involving the use of radioactive isotopes. Autoradiograph, diagrams, tables. 14 ref. (S19)

**309-S. Manual of Analytical Procedures for the U235 Recovery Process.** M. T. Kelley, P. F. Thomason, L. T. Corbin, S. A. Reynolds, C. L. Burros and E. J. Frederick. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* ORNL-983, Aug. 1951, 156 p.

Ionic, radiochemical and phyical analytical procedures most suitable for control of the process. Tables, graphs, diagrams, photographs. 76 ref. (S11, U)

**310-S. Plant Application of Acceptance Sampling by Attributes.** S. E. Peters. *Tooling and Production,* v. 22, May 1956, p. 83-85.

Comparison of four sampling plans which might be used in place of inspection by assemblers. Photographs, table. (S12)

**311-S. Quality Control of Job Lot Production.** Joseph Kalmanek. *Tooling and Production,* v. 22, May 1956, p. 118, 232.

Advantages and disadvantages of a statistical quality control program as applied to a quality product. Photographs. (S12)

**312-S. Physico-Chemical Methods of Uranium Production Control.** A. P. Vinogradov. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 206-215.

Research concerned with the development of direct physico-chemical methods of determining uranium and its mixtures on a large scale, without preliminary chemical separation or concentration. Tables, graphs, oscillograms, X-ray spectra. 8 ref. (S11, U)

**313-S. The Analysis of Low-Grade Uranium Ores and Their Products.** M. D. Hassialis and R. C. Musa. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 216-221.

Fluorimetric method; mass spectrometric isotope dilution method. Tables. 8 ref. (S11, U)

**314-S. The Physical Method of Determining the Content of Uranium, Radium and Thorium in Radioactive Ores.** G. R. Golbek, V. V. Matvejev and R. S. Shliapnikov. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 234-240.

An apparatus was designed and constructed that made possible a single and simultaneous determination of uranium, radium and thorium content based on measurements of beta and gamma radiation. Diagrams, photographs, tables. 4 ref. (S11, Th, Ra, U)

**315-S. Analysis of Mixed Uranium and Thorium Ores by the Measurement of Gamma Radiation.** A. M. Baptista and J. Palacios. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 241-245.

Apparatus, principles and testing of the analytical method. Tables, graphs, photograph. (S11, U, Th)

**316-S. Determination of the $U^{235}$ Content in Uranium by a Radiochemical Method.** I. G. deFraenz and W. Seelman-Eggebert. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 246-249.

Details of method; its application to the analysis of depleted uranium; precision obtained with enriched uranium samples. Graphs. 6 ref. (S11, U)

**317-S. Polarography of Uranium: Polarographic Determination of Uranium in Ores Without Preliminary Chemical Separation.** Milenko V. Susic. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 254-259.

An investigation of uranium and other elements in acidic and alkaline ascorbic supporting electrolyte. Tables. 17 ref. (S11, U)

**318-S. Separation of Alkali Metals and Alkaline-Earth Metals From Uranium and Their Determination by Flame Spectrophotometry.** Julia F. Possidoni de Albinati and Jorge H. Capaccioli. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 299-306.

Reagents and instruments; spectra of alkali metals and alkaline-earth metals; calibration curves and their analytical application. Tables, graphs. 10 ref. (S11, U)

**319-S. Estimation of Traces of Gallium, Indium and Thallium by Flame Spectrophotometry, Its Application in the Analysis of High Purity Uranium.** A. E. Lagos. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 307-312.

Separation from uranium by ether extraction from the nitrates in a nitric acid medium. Tables, graphs. 8 ref. (S11, U, Tl, In, Ga)

**320-S. Estimation of Lanthanum, Iron, and Magnesium by Flame Spectrophotometry.** Julia Flavia Possidoni de Albinati. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 313-319.

A study of the possibility of determining iron, magnesium and lanthanum together or by the separation of the iron as a chloride in 6*M* hydrochloric medium, after uranium extraction. Diagram, tables, graphs. 13 ref. (S11, U, La, Fe, Mg)

**321-S.** (Spanish.) **The Determination of Nitrogen in Steels.** R. Suarez Acosta. *Instituto del Hierro y del Acero,* v. 9, no. 44, Mar. 1956, p. 315-319.

Bibliographical review of different processes for determining gases in steels, with special mention of determination of nitrogen by chemical and vacuum diffusion methods. Describes new apparatus for analyzing gases in steels. Photographs. 8 ref. (S11, ST)

**322-S. Spectrophotometric Determination of Microquantities of Beryllium with *p*-Nitrobenzene-Azo-Orcinol.** J. L. Huguet and A. Aguilo. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 325-338.

Reaction of beryllium with the dye produces, over a specific pH range, a single red highly dissociated complex, enabling spectrophotometric determination under strictly controlled conditions. Micrographs, tables, graphs, photograph. 35 ref. (S11, Be)

**323-S. Separation and Determination of Zirconium in Samples of Uranium and Beryllium.** J. F. Possidoni de Albinati and J. H. Capaccioli. Paper from "Proceedings of the Inter-

national Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 344-349.

Separation and spectrophotometric determination methods; influence of uranium, beryllium, iron, thioglycolic acid and thorium on zirconium colorimetry. Graphs, tables. 6 ref. (S11, Be, U, Zr)

**324-S. Determination of Microquantities of Cadmium in Uranium.** Rafael H. Rodriguez Pasqués and Julia F. Possidoni de Albinati. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 350-355.

Spectrophotometry of the red-colored compound of cadmium with diphenylthiocarbazone. Tables, graphs. 13 ref. (S11, Cd, U)

**325-S. The Use of Radioactive Isotopes in the Study of the Analytical Chemistry of Zirconium and Hafnium.** N. S. Poluectov. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 572-579.

Determination of zirconium in ores. Methods for separating hafnium by means of distributive chromatography on paper and by counter-current extraction. Tables. 13 ref. (S11, Hf, Zr)

**326-S.** (Polish.) **Determining Internal Defects of Steel.** J. Gorecki and J. Janicki. *Wiadomosci Hutnicze,* v. 12, no. 3, Mar. 1956, p. 70-77.

Classification of defects and methods of detection, including recognition of impurities. Deep etching, color, other tests. Diagrams, tables, photographs. 5 ref. (S13, ST)

**327-S.** (Russian.) **Radioactive Isotopes in Metallurgy.** Iu. V. Kornev. *Metallurg,* no. 1, Jan. 1956, p. 15-19.

A popularization of general principles for application of radioactive isotopes in metallurgical practice. Diagrams. (S19)

**328-S. Quantitative Spectrographic Determination of Zirconium and Niobium in Uranium Metal.** J. A. Goleb. *Analytical Chemistry,* v. 28, June 1956, p. 965-967.

A spectrographic method enables fast routine analyses of a large number of uranium metal samples containing about 5.5% zirconium and 1.5% niobium. Excitation is by a high-voltage condensed spark. Tables, graphs. 4 ref. (S11, Cb, V, Zr)

**329-S. Spectrographic Determination of Rhodium in Platinum-Rhodium Alloys.** Arpad Bardocz and Ferenc Varsanyi. *Analytical Chemistry,* v. 28, June 1956, p. 989-993.

Investigations carried out for the alloy content range of 1 to 25% of rhodium. The solutions were excited by the rotating pin electrode technique. Graphs, diagram, tables. 16 ref. (S11, Rh, Pt)

**330-S. Semiquantitative Spectrochemical Analysis of Silicon.** Paul H. Keck, A. L. MacDonald and J. W. Mellichamp. *Analytical Chemistry,* v. 28, June 1956, p. 995-996.

The impurities that may be present in high-purity silicon are concentrated by the condensation of the distillate from a molten bead of silicon in a specially designed vacuum system. The silicon is melted by high-frequency induction, and the resultant distillate is spectrochemically analyzed. Table, diagram. 7 ref. (S11, Si)

**331-S. Determination of Trace Elements in Titanium by Neutron Activation Analysis.** W. A. Brooksbank, Jr., G. W. Leddicotte and S. A. Reynolds. *Analytical Chemistry,* v. 28, June 1956, p. 1033-1035.

Determinations of microgram and submicrogram concentrations of many elements when they appear as impurities in titanium and its alloys. Tables, graph. 8 ref. (S11, Ti)

**332-S. Simultaneous Determination of Carbon and Hydrogen in Titanium and Titanium Alloys.** R. B. Nunemaker and S. A. Shrader. *Analytical Chemistry,* v. 28, June 1956, p. 1040-1042.

Use of microcombustion technique. The titanium is burned in oxygen, using a iron-copper-tin flux at 1200° C. The carbon and hydrogen are converted to carbon dioxide and water. Diagram, tables. 8 ref. (S11, Ti)

**333-S. British Standards for Aluminium and Its Alloys—1955 Revisions.** E. Elliott. *Metallurgia,* v. 53, no. 318, Apr. 1956, p. 157-162.

Revisions in standards for nomenclature of materials, dimensional tolerances and individual specifications. Tables. 3 ref. (S22, Al)

**334-S. Liquid-Liquid Extraction Procedures in Inorganic Analysis. III. A Review of Practical Applications With Particular Reference to Metallurgical Analysis.** T. S. West. *Metallurgia,* v. 53, no. 318, Apr. 1956, p. 185-188.

The extraction of aluminum, gallium, indium, tantalum, and rare earths. Tables. 31 ref. (To be continued.) (S11, EG-g, Ta, In, Ga, Al)

**335-S. Radioisotopes—Versatile Research Tools.** G. D. Calkins. *Nucleonics,* v. 14, May 1956, p. 42-43.

Examples illustrating the breadth and diversity of radiotracing techniques. Micrograph, autoradiograph. 5 ref. (S19)

**336-S. Industrial Thickness Gages.** George B. Foster. *Nucleonics,* v. 14, May, 1956, p. 66-67.

Significance of an automatic, continuous noncontacting gage using radiation to measure and control product thickness is considered. Typical improvements in process control upon instituting radioactive gaging tabulated. Photographs. (S14)

**337-S. Appraising the Quality of Tinplate.** W. E. Hoare. *Sheet Metal Industries,* v. 33, no. 348, Apr. 1956, p. 239-242, 246.

Thickness of tin coating, determination of tin-iron alloy, porosity and corrosion tests. Photographs. (S14, L16, Sn)

**338-S.** (English.) **Studies on the Determination of Metals by Extraction Method of Metal Organic Compound. IX. Determination of Antimony and Bismuth With Antipyrine and Potassium Iodide.** Emiko Sudo. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 6, Dec. 1955, p. 568-574.

Antimony and bismuth, when potassium iodine and antipyrine were added to them in acid solution, formed compounds of antipyrine-antimony iodide and antipyrine-bismuth iodide respectively which could be extracted with an organic solvent, and photometrically determined. Table, graphs, ultraviolet spectro. 4 ref. (S11, Sb, Bi)

**339-S.** (English) **Studies on Flame Spectrochemical Analysis. II. Determination of Microamounts of Calcium and Magnesium.** Shigero Ikeda. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 6, Dec. 1955, p. 575-582.

Various alcohols were adopted as solvents to intensify the excitation of flame emission of calcium and magnesium. Methyl alcohol was found to be the most effective solvent to increase the sensitivity of the emission intensity of these two elements. Tables, graphs. 2 ref. (S11, Ca, Mg)

**340-S.** (French.) **Examining With Magnetic Powders. Some Considerations Relative to a Standardization of the Test.** R. Castro. *Centre de Documentation Siderurgique, Circulaire d'Informations Techniques,* v. 13, no. 4, 1956, p. 787-795.

Magnetization by passing a direct current through a steel piece, magnetization by a spool around the piece, possibilities of standardizing the magnetic powder test. Tables, diagrams. (S13, ST)

**341-S.** (German.) **Hydrogen Determination in Electric-Furnace Steels.** Werner Geller, Karl Bungardt and Peter Hammerschmid. *Archiv für das Eisenhüttenwesen,* v. 27, no. 4, Apr. 1956, p. 235-240.

Sampling, determination of diffusionable hydrogen at 600° C. and hydrogen inclusion. Hydrogen behavior during steel production in basic electric furnace. Graphs, diagrams. 29 ref. (S11, D5, ST)

**342-S.** (German.) **Photometric Investigation of Cast Iron and Steel.** H. Kopp and E. Zindel. *Giesserei,* v. 43, no. 9, Apr. 26, 1956, p. 210-216.

Compilation and simplification of photometric methods existing in the literature. Ways of analysis, chemicals and reagents necessary for the above. 4 ref. (S11, ST, CI)

**343-S.** (German.) **Continuous Mass-Spectrographic Gas Analysis in a Vacuum Furnace.** H. Landsberg, E. E. Escher and St. A. Dawkins. *Vakuum-Technik,* v. 5, nos. 1-2, Apr. 1956, p. 1-7.

Application of a mass spectrometer in production process analysis during metal smelting in a vacuum furnace. Tables, graphs, diagrams. (S11, C25, D8)

**344-S.** (Hungarian.) **Determination of the Nitrogen Content of Cermets.** Karoly Györbiro and Eleonora M. Romwalterné. *Kohaszati Lapok,* v. 11, no. 3, Mar. 1956, p. 112-114.

Determination based on converting the bound nitrogen ammonia salt. Methods for dissolving cermets and for ammonia determination. Tables, diagram. 8 ref. (S11, C-n, N)

**345-S.** (Japanese.) **Rapid Determination of Small Amounts of Carbon in Iron and Steel. I. Modification of the Gas Volumetric (Gakushin) Method for Determining Low Carbon Contents.** Takuho Ikegami, Ohiko Kammori and Akira Amano. *Iron and Steel Institute of Japan, Journal,* v. 41, no. 5, May 1955, p. 531-535.

0.01 to 0.5% carbon in iron and steel can be determined with an accuracy of ±0.002% within about 12 min. Method has disadvantage of needing temperature and drainage corrections after each measurement of gas volume. Diagram, graphs, table. 9 ref. (S11, Fe, ST)

**346-S. Routine Aircraft Inspection by Radiography.** *Engineering,* v. 181, May 11, 1956, p. 338-341.

Developments by British airlines and manufacturers; aircraft radiography on the Continent. Photographs, radiograms. (S13, Al)

**347-S. Testing the Gas-Content of Molten Metals in a Foundry.** B. R. Deoras and V. Kondic. *Foundry Trade Journal,* v. 100, May 24, 1956, p. 361-364, 366.

Results justify the application of the density test under actual foundry conditions. Comment on the qualitative reduced-pressure test for gas in aluminum alloys. Graph, diagrams, tables. 7 ref. (S11, E25)

**348-S. Application of the Electron Probe Microanalyser.** J. Philibert and C. Crussard. *Iron and Steel Institute, Journal,* v. 183, May 1956, p. 42-47.

Instrument permits elementary point analyses to be made over an area of 1 to 2 μ diam. It is useful in studies of iron ores, selective oxidation during the formation of scale, segregation of chromium, nickel and manganese; transformation in steels and in diffusion problems. Tables, photographs, micrographs. 7 ref. (S11, M23)

**349-S. Spectrophotometric Determination of Zirconium in Thorium.** Louis Silverman and Dorothy W. Hawley. *North American Aviation, Inc. Atomics International (U. S. Atomic Energy Commission),* NAA-SR-1446, May 1956, 16 pages.

The colorimetric determination of zirconium using sodium alizarin sulfonate as reagent was adapted to tolerate at least 200 mg. of thorium. Graphs, tables. 15 ref. (S11, Th, Zr)

**350-S. Planning for Tomorrow's Gaging.** Louis O. Heinhold, Jr. *Tool Engineer,* v. 36, June 1956, p. 95-100.

Present status and future prospects for automatic gaging. Gages for small lot production. Tape controlled gages. Photographs. (S14)

**351-S.** (English.) **New Methods of Gear Inspection.** M. D. Genkin. *Acta Technica Academiae Scientiarum Hungaricae,* v. 14, nos. 3-4, 1956, p. 267-278.

Two gear inspection methods based on judging the quality of gears according to the composite error of contact and noise produced. Graphs, photographs, diagrams, oscillograms. (S14, S13)

**352-S.** (Czech.) **Testing Light Alloys With Testing Coil.** M. Jancova. *Strojirenstvi,* v. 6, no. 5, May 1956, p. 336-338.

Methods based on changes of electrical conductivity of materials tested. Description of apparatus. Graphs, diagrams. 5 ref. (S13, EG-a)

**353-S.** (French.) **Rapid Analysis of Stainless Steels.** J. Culberston and R. M. Fowler. *Metallurgie,* v. 88, no. 4, Apr. 1956, p. 359, 361, 363, 365.

Different colorimetric methods used to determine chromium, nickel and manganese in steels. New method uses a Beckman spectrophotometer. Tables, photograph. 7 ref. (S11, SS, Cr, Mn, Cr)

**354-S.** (French.) **Utilization of Platinum Metals in Thermometry.** R. Lacroix. *Revue de Métallurgie,* v. 53, no. 1, Jan. 1956, p. 48-56.

Fire resistance, chemical passivity and availability in high-purity condition make platinum and platinum-rhodium alloys desirable in resistance thermometers and thermo-elements for high precision measurements. Tables. 16 ref. (S16, Rh, Pt)

**355-S.** (French.) **A Study on the Sensitivity of Gamma-Radiographic Examination of Cast Iron and Aluminum Alloy Pieces With Iridium-192.** A. Blondel and P. Broquet. *Revue de Métallurgie,* v. 53, no. 3, Mar. 1956, p. 233-239.

Pieces of cast iron and A-U5 alloys, with thicknesses varying from 5 to 60 mm., were examined and the detection sensitivities determined with penetrameters and by the contrast film method. Diagrams, graphs. 10 ref. (S13, Al, CI)

**356-S.** (German.) **New Optical Method of Measurement of Thinnest Films, Also of Corrosion Layers.** H. Schopper. *Forschung auf dem Gebiete des Ingenieurwesens,* v. 22, Ausgabe B, no. 2, 1956, p. 56-62.

Improved method of measuring up to single-atom layers by means of interferometry. Diagrams, graphs. 33 ref. (S15)

**357-S.** (Russian.) **Ultrasonic Detection of Flaws in Butt-Welded Joints.** A. K. Gurvich. *Avtomaticheskaia Svarka,* v. 9, no. 2, Mar.-Apr. 1956, p. 68-75.

Ultrasonic detection methods, apparatus and devices for more accurate ultrasonic inspection, graphic data on their performance. Diagrams, graphs, photographs. 2 ref. (S13)

**358-S.** (Russian.) **Detection of Nickel Traces by the Method of Precipitation Chromatography.** V. V. Oshtshapovsky. *Zhurnal Analiticheskoi Khimii,* v. 11, no. 2, Mar.-Apr. 1956, p. 170-176.

Nickel may be detected by method of precipitation chromatography with dimethylglyoxime in the presence of great amounts of cobalt, iron, and copper ions. Tables. 16 ref. (S11, Ni)

**359-S.** (Spanish.) **Recommendations for Defining the Minimum Conditions Necessary for Rolled or Forged Structural Carbon or Low-Manganese Steels Suitable for Electric Arc Welding.** *Ciencia y Técnica de la Soldadura,* v. 6, no. 29, Mar.-Apr. 1956, 6 p.

Recommendations are applicable to sheet, rods, profiles and plates used in metal construction. Tables. (S22, K1, ST)

# T

## Applications of Metals in Equipment

**152-T. Porous Metal Filters.** Edward D. Kane. *Applied Hydraulics,* v. 9, May 1956, p. 76-77.

Their application for a high degree of oil filtration in hydraulic servomechanisms. Graph, photographs. (T7)

**153-T. What's Titanium's Future in Aircraft Hydraulic Circuits?** Don F. Collins. *Applied Hydraulics,* v. 9, May 1956, p. 124, 126, 128.

Investigation to determine whether titanium would provide a solution to the problem of high temperature and increased system pressures. Photographs, tables. (T7, T24, Ti)

**154-T. Zirconium Alloys for Nuclear Reactor Applications.** A. D. Schwope and W. Chubb. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-751, June 1952, 22 p.

A number of binary and ternary zirconium-base alloy systems investigated in an attempt to develop a zirconium alloy for nuclear reactor applications. Tensile, hot hardness, corrosion, and heat treating properties determined. Tables. (T25, Q23, R general, J general, Zr)

**155-T. The Selection of Materials for Some Petroleum Refinery Applications.** J. F. Mason, Jr. *Corrosion,* v. 12, May 1956, p. 199-206.

Extensive tabulated data with accompanying discussions are devoted to quantitative information on the performance of various ferrous and nonferrous alloys in refinery service. Photograph, tables. 3 ref. (T29, R7)

**156-T. Processing Under Extreme Conditions. Selection of Alloys for Service Requirements.** James W. Freeman and Howard R. Voorhees. *Industrial and Engineering Chemistry,* v. 48, May 1956, p. 861-871.

Principles of using available data to select alloys for vessels for extreme pressure at elevated temperature. Tables, graphs, 17 ref. (T26)

**157-T. Aluminum Heat Exchangers. Tomorrow's Top Market for Tubing?** *Modern Metals,* v. 12, May 1956, p. 35-36, 38.

Aluminum's low cost, light weight, corrosion resistance, and high-thermal conductivity promise big volume use in petroleum, chemical and the process industries. Table, photographs. (T29, Al)

**158-T. Aluminum in the Consumer Industries in India.** N. R. Srinivasan. Paper from "Directory of Aluminum". The Electrochemical Society, p. 20-24.

An account of the uses of aluminum in industries such as transport, utensils, cables and conductors, extrusions, foil, powder and paste and chemicals. Tables. 11 ref. (T general, Al)

**159-T.** (German.) **Cutting and Shaping Tools for Small Production in a Punching Shop.** Ernst Vergen. *Zeitschrift für Metallkunde,* v. 47, no. 4, Apr. 1956, p. 217-220.

Examples show how to manufacture cutting and shaping tools at low cost for small production runs. Diagrams, photographs. (T5, G general)

**160-T.** (Czech.) **Sintered Machine Parts as Replacements for Castings and Forgings.** V. Prochazka. *Strojirenstvi,* v. 6, no. 3, Mar. 1956, p. 209-211.

General principles for selecting sintered parts; economic factors involved in their application; main qualities of metallic powders used for manufacturing sintered parts. Table, diagrams, photographs. 3 ref. (T7, H general)

**161-T.** (French.) **Orienting the Builder on the Selection of Cast Metals.** Raymond Chavy. *Fonderie,* no. 123, Apr. 1956, p. 133-142.

Examines different properties that should be required in cast metals and alloys; classification of different ferrous and nonferrous alloys; application to machine-tool frames, a truck engine housing, and cast gears. Tables. (T7)

# V

## Materials

**General Coverage of Specific Materials**

**100-V. New Aluminum Casting Alloy XA140 for Elevated Temperature Applications.** R. C. Lemon and W. E. Sicha. *American Foundrymen's Society, Preprint No.* 56-61, 1956, 3 p.

New alloy contains 8% Cu, 6% Mg, and 0.5% each of Mn and Ni. At temperatures of 400 to 600° F., the tensile and fatigue strengths are superior to those of other commercial aluminum casting alloys, and its resistance to loss of high-temperature strength upon prolonged heating is outstanding. Graphs. 3 ref. (Q23, Q7, Al)

**101-V. New Aluminum Permanent Mold Casting Alloys C355 and A356.** R. C. Lemon and H. Y. Hunsicker. *American Foundrymen's Society, Preprint No.* 56-62, 1956, 5 p.

Two new aluminum alloys that provide high levels of strength and ductility for permanent mold castings. Designated C355 and A356,

these higher purity variations of alloys 355 and 356 offer the design engineer a wide range of mechanical properties. Graphs, photographs, tables. 3 ref. (E12, Q23, Al)

**102-V. An Evaluation of ZH62XA Magnesium Sand Casting Alloy.** K. E. Nelson and W. P. Saunders. *American Foundrymen's Society, Preprint No.* 56-64, 1956, 9 p.

Combines a reasonable degree of castability with excellent tensile properties at room temperature. Its creep resistance at moderately elevated temperatures appears to be improved over alloy ZK51A. It can be welded by argon-arc or heli-arc methods and no special procedures are required to apply surface protecting treatments. Graphs, photographs, tables. 18 ref. (E general, Q23, K1, Mg)

**103-V. Malleable Base Spheroidal Iron.** F. B. Rote, E. F. Chojnowski and J. T. Bryce. *American Foundrymen's Society, Preprint No.* 56-81, 1956, 10 p.

A new high-strength alloy having graphite in a spheroidal form in a highly stable matrix. The metal is heat treated by conventional anneal, quench and draw processes. Graphs, micrographs, photographs, tables. (CI)

**104-V. "Gmoodie"—A Low-Cost Die Material.** J. C. Holzwarth and A. L. Boegehold. *Metal Progress,* v. 69, May 1956, p. 49-53.

Forming dies made from a new zinc-base alloy will last three to four times as long as dies made from conventional zinc alloys. Greater life is due to a dispersion of hard $Ni_3Ti$ particles in the matrix that increases wear resistance. Graphs, micrograph, photographs, table. (SG-j, Zn)

**105-V. Manganese-Copper High-Damping Alloys.** J. W. Jensen and J. A. Rowland, Jr. *Product Engineering,* v. 27, May 1956, p. 135-137.

Mechanical properties, fabrication characteristics, potential applications of alloys having the unusual combination of high tensile strength and high damping capacity. Diagrams, graphs, table. (Cu)

**106-V. Thermenol, Non-Strategic Aluminum-Iron Base Alloy for High-Temperature Service.** J. F. Nachman and W. J. Buehler. *U. S. Naval Ordnance Laboratory, Navord Report* 3700, June 1954, 14 p.

Details of the melting, casting and hot and cold rolling techniques used in producing the thermenol-type alloys (aluminum-iron with ternary additions) in sheet form, with particular emphasis on the importance of obtaining a fine equi-axed grain size in the cast slab. Diagrams, photographs, tables. (SG-h, Al, Fe)

**107-V. Status of Beryllium Technology in the U.S.A.** A. R. Kaufmann and B. R. F. Kjellgren. Paper from "Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. v. VIII. Production Technology of the Materials Used for Nuclear Energy". United Nations. p. 590-599.

Production, fabrication, metallurgy, properties, corrosion, health hazards and predictions for the future. Table. 20 ref. (Be)

**108-V. High-Strength Steel 4340.** John Dietz and L. H. McCreery. *Aero Digest,* v. 72, May 1956, p. 48, 50, 52.

Rigid requirements for a lightweight airframe alloy in the 400° F. tempering ranges are met through special processing and plating of the above. Tables. (T24, AY)

**109-V. Molybdenum in Low and Medium Alloy Steel Castings.** W. J. Jackson. *Alloy Metals Review,* v. 8, Mar. 1956, p. 2-8.

Effect of molybdenum on properties and uses of the castings. Photographs, tables, graph, 26 ref. (CI, Mo)

**110-V. Latest Developments in Spheroidal-Graphite Iron.** W. W. Braidwood. *Foundry Trade Journal,* v. 100, May 17, 1956, p. 321-330.

Use of metallic magnesium for inoculation, use of nickel-free magnesium, foundry equipment, mechanical properties, heat treatment and applications of nodular iron. Photographs, diagrams, micrographs, 12 ref. (CI)

**111-V. New Applications, New Compositions, and New Production Methods Highlight the Expanded Use of Light Alloys—Aluminum, Magnesium and Titanium.** P. D. Frost. *Machine Design,* v. 28, May 31, 1956, p. 86-89.

Fabrication, properties and applications. New developments in alloy composition, heat treatment and stability. Compares light alloys with other materials, such as stainless steels. Photographs, graphs, diagrams, tables. (EG-a)

**112-V. Copper and Copper Alloys. A Survey of Technical Progress During 1955.** E. Voce. *Metallurgia,* v. 53, no. 318, Apr. 1956, p. 143-152.

Finishing and plating, properties and applications, corrosion, joining, powder metallurgy, physical metallurgy, analysis and testing. 199 ref. (Cu)

**113-V. Molybdenum.** C. L. Miller. *Times Review of Industry,* v. 11, new ser., May 1956, p. 28, 31.

Sources, production statistics, fabrication, prices and uses. Graphs, tables, 7 ref. (Mo)

**114-V. Some Aspects of Aluminum Research in India.** E. G. Ramachandran. Paper from "Directory of Aluminium." The Electrochemical Society, p. 26-29.

Present status of research along the lines of production methods, structure and properties, electrical conductors, protective coatings, bearings, high-temperature alloys and coinage. 11 ref. (Al)

**115-V. The Properties of Thorium Alloys.** Murray C. Udy. and Francis W. Boulger. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-89, Sept. 1951, 93 p.

Structure and properties of 39 thorium alloy systems. Diagram, tables, graphs. 76 ref. (Th)

**116-V. New Alloys for Automotive Turbines.** Donald N. Frey. *Foundry,* v. 84, June 1956, p. 108-111.

Costs, properties, structure and fabricating qualities of ferritic and austenitic alloys. Tables, graphs. 2 ref. (T25, SG-h)

**117-V. The Fabrication and Properties of 16-Alfenol—a Non-Strategic Aluminum-Iron Alloy.** J. F. Nachman and W. J. Buehler. *U. S. Naval Ordnance Laboratory, Navord Report* 2819, Apr. 1953, 28 pages.

Methods of fabrication from cast slab to thin-gage tape. Structure and magnetic properties. Diagram, micrographs, tables, graphs, photographs. 6 ref. (P16, Al, Fe)

**118-V.** (Czech.) **Aluminum Bronzes: Their Properties and Uses.** Bedrich Puchnar. *Hutnik,* v. 5, no. 12, Dec. 1955, p. 362-366.

Effect of nickel, maganese, iron and other additions on mechanical properties. Properties of finished products, weldability, castability, forgeability and corrosion reistance. Tables, graphs, diagrams. 2 ref. (Cu)

**119-V.** (French.) **Technical Guide for the Purchaser of Special Steels. III.** G. Grenier. *Journal du Four Electrique,* v. 65, no. 2, Mar.-Apr. 1956, p. 63-65.

Structures of special steels, variations depending on carbon content, heat treatment, and amount and nature of additions. (To be continued.) Graphs, table. (AY)

**120-V.** (French.) **Rare Earth Metals.** Félix Trombe. *Revue de Métallurgie,* v. 53, no. 1, Jan. 1956, p. 1-36.

Preparation, properties, alloys and applications. Graphs, diagrams, tables. 177 ref. (EG-g)

**121-V.** (Book.) **Directory of Aluminium.** N. R. Srinivasan, editor. 65 p. 1955. The India Section, The Electrochemical Society, Inc. Indian Institute of Science, Bangalore-3, India.

Articles on resources, research and uses of aluminum in India, tables of properties, specifications, standards and patents; directory of producers, manufacturers, and scientific and technical societies. (Al)

**122-V.** (Book-English.) **Magnesium Fabricating and Casting.** 83 p. 1956. The European Productivity Agency of The Organisation for European Economic Co-Operation, 2, Rue André-Pascal, Paris 16, France.

Melting, sand casting and die-casting, pressure die-casting, extrusion and rolling, forming and welding, inspection and research. (Mg)

# EMPLOYMENT SERVICE BUREAU

**The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.**

## POSITIONS OPEN

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TECHNICAL PUBLICIST: New York industrial public relations agency needs young man with flair for the written word and appreciation of industrial marketing problems. Will assist head of agency, and partnership is definitely in the cards for the right man. Engineering degree not necessary but some industrial experience is. Agency is small and growing, so only those interested in the long haul need apply. Replies held confidential. Box 7-5.

METALLURGICAL or CHEMICAL ENGINEER: Large metal fabricating company has an excellent opening in their metallurgical department for an aggressive, alert individual, 22 to 35 years old. Applicants should have some experience in metal production processes and mill problems in aluminum fabrication, either casting, rolling, drawing or extrusion. Please include in your reply complete details concerning your education, experience and salary desired. Box 7-10.

PLANT METALLURGIST: Central Massachusetts manufacturer of well-known hand and electric tools has attractive opening with good future for mechanically minded metallurgist or metallurgically minded mechanical engineer to participate in process development, quality control, product improvement, metallography and testing. Considerable emphasis will be placed on high speed steel, plain carbon and alloy steels, cast iron and heat treatment problems. We prefer young married man, about 25 to 35 years old, who would like to settle down in a small pleasant community. Good personality important. Send resume and salary range. Box 7-15.

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METALLURGIST: Position in small applied research and development group for young man with degree in metallurgy or chemical engineering. Background in physical metallurgy and modern foundry processes in ferrous and nonferrous fields desired but not required. Located in Boston plant of nationwide company. Box 7-25.

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RESEARCH METALLURGIST: With associate status. Capacity for supervising technical and semitechnical personnel. College degree in metallurgy essential. Five to eight years experience in vacuum technology and/or process development. Salary commensurate with experience. Address complete resume, experience, education and salary requirements to: R. D. Crissman, Universal-Cyclops Steel Corp., Bridgeville, Pa.

ADMINISTRATIVE POSITION: Open in government staff agency responsible for administration and coordination of the metallurgical research and development program and weapons application. Some travel required. Salary dependent on rating granted by Civil Service Commission. Box 7-30.

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NONFERROUS METALLURGIST: Or foundry engineer, wanted to improve present aluminum and bronze sand casting and permanent mold practices and develop and introduce new processes. Box 7-120.

METALLURGISTS: Recent graduates or returned servicemen. Want a career in specialty steel? Production, laboratory, or research and development. Two plants—one near Pittsburgh, one in heart of Pennsylvania, best hunting and fishing territory. Write giving full particulars, experience, education, salary requirements, to: R. D. Crissman, Universal-Cyclops Steel Corp., Bridgeville, Pa.

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ENGINEERING MANAGER: Ph.D. degree, age 33, family. Presently head of metallurgical research and consultant for large electronic firm. Publications on corrosion, ferrites, magnetic alloys, nuclear materials and semi-conductors. High degree of responsibility and initiative. Linguist, writing and speaking ability. Flair for engineering. Desires opportunity to enlarge responsibilities. Present earnings: over $10,000. Box 7-55.

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METALLURGICAL ENGINEER: B.S. degree, family, veteran, age 35. Ten years experience in research, development, production and technical sales in powdered metals, heat treatment, deep drawing and plating fields. Desires position with management responsibilities and opportunities. Box 7-65.

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